General Comments on the Course: This course is intended to introduce graduate students to the use of electrochemical methods in characterizing polymer films. This includes the transport properties of the films, their electroactive and ion exchange properties, as well as how properties change upon forming composite materials. The course may be of interest to students in pharmacy and chemical engineering who evaluate polymer, film, coatings, and membrane properties.

Text: Information will be provided in lecture and hand outs. For more detailed information about voltammetry, see, for example, Electrochemical Methods by Allen J. Bard and Larry R. Faulkner.

ICON: The class website is at http://icon.uiowa.edu/. All registered students should have access through their hawkid and password; if you are having trouble, please let me know. The website will contain information for the class, including updates and supplemental material.

Prerequisites: Undergraduate analytical and physical chemistry.

Course Topics:
- Introduction to Electrochemistry and Electrochemical Methods
- Classes of Polymers and Film Formation
- Transport through Inert Films
  - Uniform Films
  - Films with Pinholes
  - Graded Density Films
  - Crusted Films
- Polymer Films
  - Redox Polymers
  - Ion Exchange Polymers
  - Electron Conducting Films
- Kinetic Models of Catalytic and Mediated Reactions in Films
- Composite Films

Class Requirements: The assignments for this class are to evaluate three papers from the literature according to the methods presented in class. The papers are of your choosing. Details about the assignments are provided below. Assignments will be submitted through DROPBOX on ICON.

Because of the nature of the handouts and lecture as well as the emphasis on class participation, class attendance is highly encouraged.

Exams: There are no exams or final.

Grading: Grade will be determined by class participation (25%) and the assignment of three literature evaluations (75%).
Assignment: Three Literature Data Extractions

The first electrochemical characterization of polymer films were reported in the late 1970’s. As covered in class, five basic classes of polymer films have been evaluated since that time.

1. Inert films
   (a) uniform
   (b) pinholed
   (c) graded
   (d) crusted films.
2. Redox polymers
3. Ion exchange polymers
4. Electron conducting polymers
5. Composites

The assignment is to analyze data in each of three references using the methods described in class. Each reference must be for a different class of films. The objective is to practice and demonstrate the methods and films, as described in class. Several additional rules of engagement follow.

What is in the reports: Each report will include the following. The first three components (description, analysis, and assessment) should be 2 to 3 pages.

1. A brief description of the system
2. Your analysis
3. A brief assessment of your results as compared to those in the paper.
   (a) Literature data may or may not report analysis of the data in the paper. If there is no analysis, please analyze the data in the paper to the extent possible. If there is an analysis, please analyze the data in the paper and compare your analysis to that provided by the authors.
4. Plots from spreadsheets that reflect the equations and models described in your report
   (a) Spreadsheet sheets that summarize data are also highly appropriate to add but the important plots should be appended outside the spreadsheet. These plots should suffice so the reader does not have to open the spreadsheet.
5. A pdf of the original article

Where are the references and which references are appropriate:

1. References may be found in journals and in some of the review articles listed in course handouts. (Historically, students have search a while to find their references so don’t wait until the last moment to find your articles.)
2. References specifically cited in class or the notes may not be used. It is anticipated that each student will have a unique set of references. Please work independently.
3. The three references must apply to an inert uniform film and two other, distinct classes of films as listed above.
   (a) For example, the two other classes of films could include (Inert - pinholed and redox) and (ion exchange and composite), but inert uniform is not allowed a second time.
   (b) An example of the student’s or a colleagues raw data may be substituted for one the references.
4. Within the three references, please include an example of each rotating disk voltammetry, cyclic voltammetry, and either potential step (chronoamperometry), microelectrodes, optically transparent electrodes, or some other measurement. Each example does not need to include all methods, but good cases will include a steady state and a transient method for maximum deconvolution of data.
5. For the inert uniform report, please include a steady state and a transient electrochemical method.
6. Due Dates: The uniform inert film report is due 28 April by 20:30 and the other two reports are due 7 May by 23:30. Please submit via Dropbox on ICON.

Please let me know if you have any questions.
From the College of Liberal Arts and Sciences: Teaching Policies & Procedures
(http://clas.uiowa.edu/faculty/teaching-policies-resources-syllabus-insert)

Administrative Home: The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS Academic Policies Handbook at http://clas.uiowa.edu/students/handbook.

Electronic Communication: University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondences (Operations Manual, III.15.2, k.11).

Accommodations for Disabilities: A student seeking academic accommodations should first register with Student Disability Services and then meet privately with the course instructor to make particular arrangements. See www.uiowa.edu/~sds/ for more information.

Academic Honesty: All CLAS students or students taking classes offered by CLAS have, in essence, agreed to the College’s Code of Academic Honesty: “I pledge to do my own academic work and to excel to the best of my abilities, upholding the IOWA Challenge. I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate the Code of Academic Honesty.” Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled (CLAS Academic Policies Handbook).

CLAS Final Examination Policies (There is no final for this class): The final examination schedule for each class is announced by the Registrar generally by the fifth week of classes. Final exams are offered only during the official final examination period. No exams of any kind are allowed during the last week of classes. All students should plan on being at the UI through the final examination period. Once the Registrar has announced the date, time, and location of each final exam, the complete schedule will be published on the Registrar’s web site and will be shared with instructors and students. It is the student’s responsibility to know the date, time, and place of a final exam.

Making a Suggestion or a Complaint:
Students with a suggestion or complaint should first visit with the instructor (and the course supervisor), and then with the departmental DEO. Complaints must be made within six months of the incident (CLAS Academic Policies Handbook).

Understanding Sexual Harassment: Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI Comprehensive Guide on Sexual Harassment for assistance, definitions, and the full University policy.

Reacting Safely to Severe Weather: In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the Department of Public Safety website.