

School of Management, Engineering and Technology  
Department of Electrical Engineering and Renewable Energy  
CHE 260: Electrochemistry for Renewable Energy Applications

Catalogue Description (2009/2010):	Development of electrochemistry concepts, including thermodynamics, reaction kinetics, charge transport and mass transport. Topics are presented in the context of fuel cells, electrolysis, electroplating and batteries. Also discussed, the chemistry of hydrogen; its properties, production, storage and transportation.		
Hours/Credits: (Lecture-Lab-Total)	(3-3-4)		
Class Schedule:	Two 75 minute lectures, per week, one term		
Lab Schedule:	One three hour lab per week, one term		
Prerequisites:	CHE 202 or CHE 222		
Required Text:	O'Hayre, R., Cha, S.-W., Colella, W., Prinz, F.B., "Fuel Cell Fundamentals," 1st Ed., Wiley, 2005, ISBN: 0-471-74148-5		
Reference Text:	none		
Course Coordinator:	Slobodan Petrovic, Ph.D.		
	Slobodan Petrovic, Robert Bass, Todd Stevens		
Course Objectives:	<p>Upon completion of CHE 260, a student should be able to:</p> <ul style="list-style-type: none"> <li>• Balance oxidation-reduction reactions in acid and alkali environments</li> <li>• Interpret, through words and calculations, the stoichiometry of a oxidation-reduction reactions</li> <li>• Compute relationships between the variable of a gaseous reactant used in a fuel cell</li> <li>• Interpret and calculate fuel cell voltage using the Nernst equation</li> <li>• Compute the current density in a fuel cell</li> <li>• Calculate the power and energy available from a fuel cell</li> <li>• Describe the chemical features of ion-exchange materials; electrolytes</li> <li>• Compare and contrast the several types of fuel cells in terms of their chemistry</li> <li>• Understand the chemistry of batteries, including rechargeable batteries</li> <li>• Understand the chemistry of electroplating</li> <li>• Describe the methods by which hydrogen is produced</li> <li>• Describe the roll of catalysis in hydrogen utilization in fuel cells</li> </ul>		
Topics Covered:	<ul style="list-style-type: none"> <li>• Thermodynamics of Electrochemical Cells:</li> <li>• Reaction Kinetics in Electrochemical Cells:</li> <li>• Charge Transport</li> <li>• Mass Transport</li> <li>• Electrochemistry Applications</li> </ul>		
Relevant Program Outcomes:	<p>(a) an ability to apply knowledge of mathematics, science, and engineering            (b) an ability to design and conduct experiments, as well as to analyze and interpret data            (d) an ability to function on multi-disciplinary teams            (e) an ability to identify, formulate, and solve engineering problems            (g) an ability to communicate effectively            (i) a recognition of the need for, and an ability to engage in life-long learning            (l) an ability to apply the fundamentals of energy conversion and applications</p>		
Required or Elective:	Required		
Criterion 5:	Math & Basic Sciences		
Prepared By:	Robert Bass, Ph.D.	Updated:	October 20 <sup>th</sup> , 2010