Chemistry and Energy First-Year Opportunity  
Fall 2020, L07.Chem. 183.01  
Planned Syllabus*

Instructor:  
Professor Mark S. Wrighton  
Wrighton@wustl.edu  
Phone:  314-935-2400  
Hours:  By Appointment via Zoom.

Class Times:  
Tuesdays via Zoom, 2:30-3:50 p.m.

Enrollment Limited to 22 Undergraduate Students

This course is fully remote and synchronous each meeting.

CANVAS COURSE SITE:  Students can access this site by login to https://mycanvas.wustl.edu/ with your WUSTL Key. The course title is FL2020.L07.Chem.183.01. This site is a central place for instructors to communicate information and post announcements and course materials. All times mentioned in this document are based on US Central Standard Time.

Course Overview:  This seminar is intended for first year undergraduates to learn about the role that chemistry can play in addressing one of the greatest challenges we face: climate change. Chemistry has played a vital role in providing the energy needs of society, and advances in chemistry can help to develop abundant and economically viable energy technologies that do not have adverse consequences on the environment. Chemistry has long been central to the use of fossil fuel, and there remain opportunities to improve the efficiency of fossil energy resources thereby contributing to lower carbon dioxide emission per unit of energy generated. Importantly, chemistry is critical to the development of renewable energy resources, especially, solar energy for the generation of electricity and fuels. Material covered will include the challenges associated with meeting the world's increasing energy needs while reducing the emission of carbon dioxide. This class will cover the role of chemistry in energy technologies, including storage of energy.

Assignments:  Reading assignments for each class will be sent via email, and the readings will be available on Canvas.

Grades:  Grades in this class will be based on (1) attendance and quality and extent of engagement in discussion (one third of the grade); (2) a midterm 2000-word paper on one of three energy resources fossil, solar, or nuclear (one third of the grade); and (3) a final 2000-word paper on the challenges of one of the four following technologies: electrical energy storage; carbon dioxide capture from the air; solar electricity; or hydrogen fuel (one third of the grade).

Teaching Mode:  This class will be offered via Zoom, and there may be smaller group sessions. Such small group sessions may be “in person.”

Class Meeting  
#1; 9/15/20  Self-Introductions by all; What is Energy?
#2; 9/22/20  Energy Demand and Trends; Fossil Sources: Coal, Oil, Natural Gas
#3; 9/29/20  Fossil Energy and Electricity Generation

Guest Speaker:  
Mark C. Birk, Senior VP Customer and Power Operations, Ameren Missouri
#4; 10/6/20  Carbon Dioxide and Approaches to Reducing Emissions

#5; 10/13/20  Natural Gas: Abundance, Distribution, and Environmental Issues

**Guest Speaker:**  
*Mr. Dominic Popielski, Vice President Business & Economic Development, Spire*

#6; 10/20/20  Nuclear Power Plants

**Guest Speaker:**  
*Mr. Fadi M. Diya, Senior Vice President & Chief Nuclear Officer, Ameren Missouri*

#7; 10/27/20  Accidents: Chernobyl, Three Mile Island, Fukushima

#8; 11/3/20  Radioactive Waste and Storage

#9; 11/10/20  Solar Energy: Photosynthesis and Synthetic Approaches

**Midterm Paper Due: 11/10/20**

#10; 11/17/20  Photovoltaic Electricity: Efficiency and Cost

#11; 11/24/20  Photovoltaic Materials: Si and Compound Semiconductors

#12; 12/1/20 Photoelectrochemical Approaches to Fuel from Sunlight

#13; 12/8/20  Storage of Electrical Energy: Hydrogen, Batteries, Pumped Water

#14; 12/15/20  Chemistry Research Opportunities

**Final Paper Due: 12/20/20**

*Some changes may occur  
Updated 8/28/2020*