Course Policies and Syllabus

ME 6530 Fuel Cell Science and Technology

Winter 2018

(Friday, 4:00am-7:30pm, MSC 102)

Instructor: Dr. Xia Wang, Professor
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Office Hours: Friday, 12:00pm-1:00pm, before/after class, or by emails or phones

Course Web Site: https://moodle.oakland.edu/
Using your own OU email account and password to log in. Information presented in class supersedes any information posted on the course website. Student attendance at lecture is mandatory.

Textbook: None.

Recommend References:

1. Fuel Cell Systems Explained, by Larminie and Dicks, Wiley, 2003.
2. Fuel Cell Fundamentals, O'Hayre et al, John Wiley & Sons Inc., 2006
3. Fuel Cell Engines, by Matthew M. Mench, Wiley, 2008.
4. PEM Fuel Cells, Theory and Practice, by Frano Barbir, Elsevier, 2005
5. Principles of Fuel Cells, by Xianguo Li, Taylor and Francis Group, 2006 (Available at OU Library)
6. Fuel Cell Handbook-7th edition, US Department of Energy (2004). Available at https://www.netl.doe.gov/File%20Library/research/coal/energy%20systems/fuel%20cells/FCHandbook7.pdf
7. Handbook of Fuel Cells: Fundamentals, Technology, and Applications, by W. Vielstich, A. Lamm, H. A. Gasteiger(editors), Wiley, 2003. (Available at OU Library)

Course Description: This is a graduate-level mechanical engineering course which is designed to introduce you to the principles of fuel cells, and to extend your ability to design and analyze the fuel cell systems and related electrochemical systems. The course includes assignments, quizzes and projects. Some laboratory exercises may be involved. The course requires as a prerequisite an introductory course in electric engineering, chemistry, thermodynamics, thermal and fluids sciences.

Primary Course Objectives: By the end of the course, the successful student should be able to:

- Define thermodynamics, electrochemistry, and transport processes governing fuel cell operation;
- Identify various potential losses in the fuel cell and fuel cell system, and propose the appropriate ways to improve the overall efficiency of a fuel cell system.
- Apply the thermodynamics, electrochemistry, mass, thermal and fluids transport concepts to design a PEM fuel cell.
- Describe the structure and operation of various types of fuel cells.
- Describe fuel and fueling system including hydrogen generation, delivery and storage.
- Use the Comsol Multiphysics software to run the fuel cell model to numerically visualize the fuel cell performance under various operating and designing parameters.

Course Formats:

1). Homework Assignments:

a) Collaboration on homework should be limited to general discussion of the problems and approaches. Copying homework is NOT allowed.

b) Homework must be turned in within **the first five minutes** of your lecture period on the due date. Late homework will be accepted with a penalty till the home solution is published.

2). Quizzes:

A few in-class quizzes will be given throughout the semesters, which are designed to test your understanding of the fundamental knowledge of this course.

3). Lab:

One lab is designed to involve with fuel cell assembly and the performance testing Attending the lab session is required to pass this course.

4). Project: See a Separate Project Description.

Tentative Course Calendar:

Week of:	Topic:
Jan 5	Syllabus; Introductions: background, type; working principles;
Jan 12	Thermodynamics I
Jan 19	Thermodynamics II
Jan 26	Electrochemistry I
Feb 2	Comsol Multiphysics Training (tentative)
Feb 9	Electrochemistry II
Feb 16	**No Lecture**
March 2	Transport Phenomena: I
March 9	Transport Phenomena: II
March 16	**Project Progress Report**
March 24	SOFC Fuel Cell
March 30	Alkaline Fuel Cell and DMFC
April 06	Fuel Cell stack, fuel cell system and Vehicles/ Hydrogen Generation, Storage and Delivery
April 13	**Final Project Presentation**

Course Grading:

The course grade will be based on the scores earned on the following items:

Homework	**15%**
Lab	**5%**
Quiz	**40%**
Final Project	**40%**
Total	**100%**

Project Proposal	**5%**
Mid-term Presentation	**5%**
Final Presentation	**5%**
Final Report	**25%**
Course Project	**40%**

Academic conduct:
All students are expected to read, understand, and comply with the *Academic Conduct Policy* found in the *Oakland University Graduate Catalog*. The policy applies to homework and project, and is taken very seriously by the instructor. Perceived violations of this policy will be taken before the OU Academic Conduct Committee. Engineering is a profession that serves the public and demands integrity within its membership. Conduct Committee. Engineering is a profession that serves the public and demands integrity within its membership.