

Fuel Cells and Fuel Processors
Energy Systems Engineering
ChE 696

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Course Objectives:

1. Understand major types of fuel cells, their advantages and limitations.
2. Learn basics of catalysis, thermodynamics, and electrochemistry pertinent to fuel cell operation.
3. Learn basics of fuel processing, balance of plant for fuel cell systems.
4. Learn to analyze fuel cell systems.
5. Understand characterization of fuel cell operation and performance.
6. Introduce manufacturing techniques and challenges to fuel cell production.
7. Gain exposure to relevant fuel cell and fuel processing literature.

Instructional methods:

1. Lectures.
2. Literature reviews and paper reviews.
3. Open class discussion.

Student progress evaluation and grading

1. Homework assignments (45% of grade)
2. Written term paper (35% of grade)
3. Powerpoint presentation of term paper (20 % of grade)

Course textbook (recommended): Fuel Cell Systems Explained, by James Larminie and Andrew Dicks.

Date	Lecture Topics	Assignment
	Course introduction, transportation energy options/requirements	
	PEMs	
	SOFCs	
	Fuel cell thermodynamics 1	
	Fuel cell thermodynamics 2	
	Catalysis 1	
	Catalysis 2	
	Fuel processing 1	
	Fuel processing 2	
	Electrochemistry 1	
	Electrochemistry 2	
	Hydrogen storage/safety	
	Charge transport in fuel cells	
	Mass transport in fuel cells	
	Open topic	
	Fuel cell characterization/modeling	
	Fuel cell modeling and control	
	Fuel cell systems – balance of plant requirements	
	Fuel cell systems – overall operation/efficiency	
	Manufacturing of fuel cells/systems	
	Fuel cell durability/lifetime issues	
	Critical issues, adoption, future technologies	
	Presentations	
	Presentations	
	Presentations	
	Presentations	
	No class	