ME 597: FUNDAMENTALS OF ELECTROCHEMICAL ENERGY SYSTEMS
Spring 2022 (Schedule: MWF 10:30 am - 11:20 am, Venue: Wang 2579)

INSTRUCTOR **Partha P. Mukherjee**

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OFFICE HOURS **TBA**

GRADING POLICY

Homework/Quiz	15%
Examination 1	20%
Final Examination	25%
Project	40%

RESOURCE

Lectures will be developed based on the energy storage and conversion modules developed by Mukherjee and multiple resources including research papers, chapters from relevant textbooks. The following can be referred to additionally.

1. "Electrochemical Systems," Newman and Balsara (Wiley)
2. "Electrochemical Methods: Fundamentals and Applications," Bard and Faulkner (Wiley)
3. "Battery Systems Engineering," Rahn and Wang (Wiley)
4. "Handbook of Battery Materials," Eds: Daniel and Besenhard (Wiley).
5. "Modeling Transport Phenomena in Porous Media with Applications," Das, Mukherjee, Muralidhar (Springer).
6. *You are free to use any analysis tools as part of this course.*

PREREQUISITES

Strong analytical background; engineering mathematics; discussion with and approval from the instructor.

LEARNING OUTCOMES

The focus of the course will be on learning the fundamental concepts of energy storage and conversion with a goal to develop the ability for sound analysis. After finishing this course, the students should have the following learning outcomes.

1. Understand the fundamental physicochemical mechanisms and interactions that underlie in electrodes in an energy storage and conversion system (*e.g.* lithium-ion battery, polymer electrolyte fuel cell);
2. Gain knowledge of thermodynamics, kinetics, and transport phenomena (species, charge and thermal) and mechanical behavior.
3. Analyze system characteristics (performance, degradation, safety) based on the fundamental mechanisms.

PROJECT

The project, based on analysis of electrochemical energy systems, is an integral part of this course. You can choose your own group members (group size limited to 3). Each course project will be designed based on discussion with the instructor. The formal written report and presentation will constitute a significant part of your grade.

Project Milestone (tentative schedule)

Milestone	Points Breakdown	Due Date
Team List (email to instructor)	-	2nd week
Topic Selection (title and brief description of the project objective)	5	3rd week
Progress Report (4-page report including the problem statement, objective, task list with tentative schedule per task and preliminary results)	10	7th week
Draft Report	15	11th week
Final Report and Group Presentation	70	Last day of class
Total points	100	

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(each topic: approximately 1.5-2.5 weeks)