ME 618-ST-005: Introduction to Fuel Cells and Batteries T 2.30 PM – 5.20 PM (FMH 207)

Instructor: Prof. Eon Soo Lee. (Office: MEC 313 or WebEx room, with appointments) email: <u>eonsoo.lee@njit.edu</u> | phone: 973-596-3318. | Office hour: M/W 2:00 - 3:00 PM (MEC313, or WebEx) (<u>https://njit.webex.com/meet/lee2000njit.edu</u>). TA: Niladri Talukder (online meeting or MEC 333-E)-email: <u>nt22@njit.edu</u>

Objective: To understand the principles of electrochemical systems and to apply the working principles to fuel cells and batteries, and analyze the electrochemical systems.

<u>Pre-requisite</u>: Knowledge on thermodynamics, heat transfer, chemistry, physics, material sciences, math (PDE) and/or recommendation by Instructor

Text books and related materials

Ryan O'Hayre et al. *Fuel Cell – Fundamentals*, John Wiley and Sons, 1st, 2nd or 3rd edition

I. WEEKLY SCHEDULE ARRANGEMENTS

Week		Contents	Exams. Project	HW	Remark
1	9/5	Ch1. Introduction of electrochemistry Ch2A. Electrochemical thermodynamics – I			Labor Day
2	9/12	(HW1 review) Ch2B. Electrochemical thermodynamics – II		HW1	
3	9/19	(HW2 review) Ch3A. Reaction kinetics – Butler-Volmer Equation		HW2	
4	9/26	Ch3B. Reaction kinetics – Tafel Equation			
5	10/3	(HW3 review) Ch4A. Charge transport		HW3	
6	10/10	Quiz (Ch1-3) Ch4B. Charge transport	Quiz		
7	10/17	(Quiz review & statistics) (HW4A review) Ch4C. Charge transport		HW4A	
8	10/24	(HW4B-review) Ch5A. Mass transport	*Project explanation	HW4B	
9	10/31	Ch5B. Mass transport Ch7A. Electrochemical characterization methods			
10	11/7	(HW5 review) Ch7B. Electrochemical characterization methods	Project Intro- report	HW5	
11	11/14	(HW6 review) (Exam prep review) Ch6. Modeling		HW6	
12	11/21	Thursday class meeting. Thanksgiving week.			
13	11/28	Exam (Ch1-7)	Exam		
14	12/5	(Exam review) (HW7 review) Ch8. Fuel Cell types	Progress report	HW7	
15	12/12	Presentation (15 min/team+5 min Q&A) (HW8 due)	Final Presentation	HW8	
	12/15	Reading Day2	Final report		

• The schedule may be subject to change, depending on the actual running.

• All the assignments submission due is 2pm on the due date, otherwise specified.

II. Grading Policies

- (1) Grading Basis: (A (>90), B(>80), C(>65) & F (<65) out of 110) Curve only for exceptional cases (too high or too low).
 - Homework (20%)
 - Exam (40%)
 - In-Class Quiz (10%)
 - In-class Exam (30%)
 - Project (40%)

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- Final Presentation (15%)
- Final Report (15%);
- Progress Report (5%);
- Project Intro-Report (5%)
- Participation (10%)
 - In-Class participation
 - Class Attendance
 - Active Audience Participations in class (e.g. in final presentations)
- (2) Final Project (Team basis): Final presentation + Final report/Progress report/Intro-Report Option 1: Your Current Electrochemical-related research among topics from materials to system Option 2: Critical Research review from Journal papers on a selected topic of your choice
 - 1) Team member: One or two students per team (of your preference)
 - 2) Submit your intro report (2+ page) (Check Due date). It's an introduction of your research topic. (If you want, you can discuss with me by email or in class.)
 - 3) Submit your progress report (5-10 pages) (check the Due)
 - 4) Present your research presentation (in the final class)
 - 5) Submit your Final report and Final presentation (Due by the Second Reading Day)
 - 6) Please refer to the separate document on the final project information and guideline.
 - 7) Late submission 10% off within 24hrs. 30% off within one week. NOT accepted and become zero for more than one week.
 - 8) Refer to project guidelines for further details.
- (3) Homework Requirements (Individual HW submission required)
 - Homework is due 2pm by canvas, before the beginning of class on the due date.
 - Collaboration on homework is encouraged, although each person must turn in his/her own set of homework solutions.
 - Complete your work in details; Answers without detailed supporting solution process will return a substantial loss in grading.
 - <u>Please box your final answers.</u>
 - <u>LATE submission:</u> same policy as the final project above applied.
- (4) Exam Requirements
 - (a) <u>Simple Calculator only</u> allowed. (No programmable, No WIFI allowed)
 - (b) <u>Closed book & notes.</u>
 - (c) Formula sheet: One page of letter-size hand-written note permitted.
- (5) Class Attendance & Active Participation Credit
 - (a) Attendance check at the Start of class.
 - (b) Participation credit: Pay attention to lectures, Q&A and follow instructor's direction.