

Fall 2023

ME 618-005: ST: Introduction to Fuel Cells and Batteries

EonSoo Lee

Follow this and additional works at: <https://digitalcommons.njit.edu/mie-syllabi>

Recommended Citation

Lee, EonSoo, "ME 618-005: ST: Introduction to Fuel Cells and Batteries" (2023). *Mechanical and Industrial Engineering Syllabi*. 461.

<https://digitalcommons.njit.edu/mie-syllabi/461>

This Syllabus is brought to you for free and open access by the NJIT Syllabi at Digital Commons @ NJIT. It has been accepted for inclusion in Mechanical and Industrial Engineering Syllabi by an authorized administrator of Digital Commons @ NJIT. For more information, please contact digitalcommons@njit.edu.

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: consoo.lee@njit.edu | phone: 973-596-3318. |

Office hour: **M/W 2:00 - 3:00 PM** (MEC313, or WebEx) (<https://njit.webex.com/meet/lee2000njit.edu>).

TA: Niladri Talukder (online meeting or MEC 333-E)-email: nt22@njit.edu

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

Pre-requisite: 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%)
 - 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.
 - **Please box your final answers.**
 - **LATE submission: same policy as the final project above applied.**
- (4) Exam Requirements
 - (a) **Simple Calculator only** allowed. (No programmable, No WIFI allowed)
 - (b) **Closed book & notes.**
 - (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.