

## Special Topics in Chemical Engineering 1

Course Name	Course type (credit/hours)	Elective course(3/3)	Course code	D004
	Target students Division/major/grade	Chemical Engineering/Junior	Opening semester	2021 2ND SEMESTER
	Class time and classroom	Tue D(WEB303)Thu C(WEB303)	English Grade	A(100%English)
Reference to this course	Prerequisite courses	일반화학, 물리화학, 전기화학		
	Related basic courses			
	Recommended concurrent courses			
	Related advanced courses			

Instructor	Name (title/division)		Hwang Jongkook(Assistant Professor, Chemical Engineering)			
	Office Room Number	서관 235호	Office phone Number	031219384 6	e-mail	
	Office hours			Homepage address	https://jjonghwang.wixsite.com/finekooking	
Teaching Assistant	Name (title/division)					
	Office Room Number		Office phone Number		e-mail	

### 1. Introduction

This course covers fundamentals of electrochemistry and key principles for design and analysis of various energy storage devices with particular emphasis on lithium secondary batteries.

The first half of this class deals with basic electrochemistry (basic terminologies, thermodynamics, kinetics, polarization, electrode potential).

The second half provides in-depth understanding of the electrochemical energy storage devices (lithium ion batteries) and electrochemical analysis.

### 2. Course Objectives

학부3-4학년을 대상으로하여 전기화학 및 이차전지의 원리와 응용에 대한 기초지식의 함양을 목표로 한다.

Through this class, students are expected to gain knowledge and insight on how electrochemical principles are applied to the design and analysis of electrochemical energy storage devices.

### 3. Class types and activities

Due to Covid19 Pandemic, all lectures will be provided through online system, either pre-recorded videos or online live-streaming.

Lecture note will be provided before the class. Various references and supplementary materials will also be prepared for study.

### 4. Teaching Method

- |                                                                      |                                                             |
|----------------------------------------------------------------------|-------------------------------------------------------------|
| <input checked="" type="checkbox"/> lecture                          | <input type="checkbox"/> discussion and debate              |
| <input type="checkbox"/> team project(presentation and case studies) | <input type="checkbox"/> experiments(role-playing,etc)      |
| <input type="checkbox"/> designing and production                    | <input type="checkbox"/> on-site learning(on-site training) |
| <input type="checkbox"/> others                                      |                                                             |

### 5. Support Systems in Use

- |                                                          |                                                     |                                                          |
|----------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------------|
| <input checked="" type="checkbox"/> AjouBb               | <input type="checkbox"/> automatic recording system | <input checked="" type="checkbox"/> web-based assignment |
| <input checked="" type="checkbox"/> cyber lecture        | <input type="checkbox"/> online content             |                                                          |
| <input type="checkbox"/> class behavior analyzing system | <input type="checkbox"/> others                     |                                                          |

### 6. Teaching Tools

- |                                                      |                                                              |                                                             |
|------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|
| <input type="checkbox"/> PBL(Problem Based Learning) | <input checked="" type="checkbox"/> CBL(Case Based Learning) | <input type="checkbox"/> TBL(Team Based Learning)           |
| <input type="checkbox"/> UR(Undergraduate Research)  | <input type="checkbox"/> FL(Flipped Learning)                | <input type="checkbox"/> DSAL(Data Science Active Learning) |
| <input type="checkbox"/> others                      |                                                              |                                                             |

### 7. Knowledge and ability required for taking this course

Basic knowledge about general chemistry, physical chemistry, and electrochemistry (if possible).

## 8. Method of Evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance		10	
midterm exam	0	0	
final exam	1	30	
quiz	2	50	
presentation			
discussion			
homework	1	10	
etc			
study hours			

## 9. Textbook and supplementary material

Main/Sub	Title (Web-site)	Writer	Publisher	Publication year
Main	Lecture note			
Main	Principles and Applications of Lithium Secondary Batteries	Jung-Ki Park	Wiley-VCH	2012
Sub	전기화학	오승모	자유아카데미	2019

## 10. Class system and Class shedule

1. 전기화학의 기초 (Basic concept of electrochemistry)
2. 전기화학 반응의 열역학과 동역학 (Thermodynamics and kinetics of electrochemical reactions)
3. 전지의 특성 분석 (Electrochemical characterization methods)
4. 리튬이온전지의 원리와 응용 (Principles and applications of lithium secondary batteries)
5. 이차전지 연구의 최신 동향 (State-of-the-art secondary battery researches and technologies)

### < Class Schedule >

\* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
1	Introduction: Electrochemistry and Batteries	E	Hwang Jongkook			

## < Class Schedule >

\* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
2	Basic concept of electrochemistry	E	Hwang Jongkook			
3	Basic concept of electrochemistry	E	Hwang Jongkook			
4	Basic concept of electrochemistry/Quiz	E	Hwang Jongkook			
5	Thermodynamics	E	Hwang Jongkook			
6	Thermodynamics	E	Hwang Jongkook			
7	Kinetics	E	Hwang Jongkook			
8	Kinetics	E	Hwang Jongkook			
9	Electrochemical analysis	E	Hwang Jongkook			
10	Lithium ion batteries	E	Hwang Jongkook			
11	Quiz/Lithium ion batteries	E	Hwang Jongkook			
12	Lithium ion batteries	E	Hwang Jongkook			
13	Lithium ion batteries	E	Hwang Jongkook			
14	Lithium ion batteries	E	Hwang Jongkook			
15	Next generation batteries	E	Hwang Jongkook			
16	Final exam.	E	Hwang Jongkook			

## 11. Other items of notification