

Electroanalytical Chemistry

Course Name	Course type (credit/hours)	Elective course(3/3)	Course code	G008
	Target students Division/major/grade	Chemistry/Sophomore	Opening semester	2021 2ND SEMESTER
	Class time and classroom	Tue C(WH507)Fri C(WH507)	English Grade	A(100%English)
Reference to this course	Prerequisite courses	Chemistry, Analytical Chemistry		
	Related basic courses	Chemistry, Analytical Chemistry		
	Recommended concurrent courses			
	Related advanced courses	Secondary Batteries		

Instructor	Name (title/division)		WONJIN KWAK(Assistant Professor, Energy Systems Research)		
	Office Room Number	Woncheon Hall 215-3	Office phone Number	2599	e-mail
	Office hours	Check in advance for available consultation hours	Homepage address	https://sites.google.com/view/wjkwak	
Teaching Assistant	Name (title/division)				
	Office Room Number	Woncheon Hall 138-1	Office phone Number		e-mail eocystk1166@gmail.com

1. Introduction

As interest in energy and the environment has recently increased, the importance of electrochemical principles and systems has also emerged. Among them, as an energy storage and conversion system, secondary batteries play a key role in today's industries. Battery performance is a major factor that determines the performance and development potential of various electrochemical-based devices such as electric vehicles and various portable devices. Since the electrochemical reaction occurring on the surface of the electrode is an important factor in determining the performance of the battery, it is very important to understand the electrochemical reaction mechanism. In electroanalytical chemistry, the thermodynamics and kinetics of the oxidation-reduction reactions occurring at the electrode/electrolyte interface are systematically and easily handled. In addition, a wide range of lectures and discussions are given on the development of next-generation secondary batteries. By taking this course, students can strengthen their basic skills about electrochemistry in the future and can grow as a research expert (company, research institute, university) related to secondary batteries.

2. Course Objectives

- Coursework Introduction

This course is intended to provide comprehensive coverage of fundamentals for electrochemistry and outline the principles of some important electrochemical measurements.

- Objectives

- 1) To understand the electrochemistry, particularly of electrode reaction, electrolyte and interfacial phenomena ? through an explanation of modern electrochemistry.
- 2) To understand the principles of some electrochemical processes and electrochemical measurements ? and apply the electrochemical techniques to research works.

3. Class types and activities

Due to COVID 19, lecture is basically based on non-face-to-face system using recorded video. A real-time video classroom will be opened every 1 or 2 weeks to provide feedback. The assignments will be submitted at a level to ensure that students understand the content of the lecture. If the COVID 19 issue is resolved somewhat, basic electrochemical experiments will be provided with the help of graduate students. Although it is an English lecture, the top priority is the students understanding of electrochemistry. To overcome the hard communication during on-line lecture due to COVID 19, lecture style can be changed after students requirements are collected. Please note that the course schedule may change due to the COVID 19.

4. Teaching Method

- | | |
|--|---|
| <input checked="" type="checkbox"/> lecture | <input checked="" 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 checked="" 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 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

It is recommended that students who have taken "Chemistry 1", "Chemistry 2" and "Analytical Chemistry" will take this course.

8. Method of Evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance		10%	1 point will be deducted for one absence of lecture (8 or more absences = F grade), Recorded upload lecture video will be set to 2 weeks for attendance deadline. Real-time lectures (non-face-to-face) will be called directly to confirm attendance.
midterm exam	1	40%	Cheating = F, Closed Book Exam (For fairness, off-line face-to-face evaluation is performed following the quarantine procedures) If the COVID 19 issue becomes too serious, a non-face-to-face "Open book exam" will be considered, and "video system and printer must be prepared previously".
final exam	1	40%	Cheating = F, Closed Book Exam (For fairness, off-line face-to-face evaluation is performed following the quarantine procedures) If the COVID 19 issue becomes too serious, a non-face-to-face "Open book exam" will be considered, and "video system and printer must be prepared previously".
quiz			
presentation			
discussion			
homework		10%	Weekly assignments will be submitted at a level to ensure that students understand the content of the lecture.
etc			
study hours			

9. Textbook and supplementary material

Main/Sub	Title (Web-site)	Writer	Publisher	Publication year
Main	전기화학 (Electrochemistry)	오승모	자유아카데미	2019
Sub	Electrochemical Methods (Not necessary), will be replaced by PPT materials	Allen J. Bard	Wiley	2000

10. Class system and Class shedule

This course introduces electrochemical methods of analysis. Advanced topics in chemical equilibrium and kinetics in analytical chemistry and electrochemical methods will also be covered in this course. Electroanalytical Chemistry course mainly focuses on electrochemical methods of analysis, including potentiometric, amperometric, coulometric, and voltammetric analysis. Fundamentals and applications of electrochemical methods as an interdisciplinary field are also introduced.

< Class Schedule >

* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
1	Orientation		WONJIN KWAK	Lecture		Watching a recorded video lecture / Real-time video feedback (zoom)
2	Introduction (Electrochemistry)		WONJIN KWAK	Lecture		Watching a recorded video lecture / Real-time video feedback (zoom)
3	Electrode Potential		WONJIN KWAK	Lecture		Watching a recorded video lecture / Real-time video feedback (zoom)
4	Electrolytes		WONJIN KWAK	Lecture		Watching a recorded video lecture / Real-time video feedback (zoom)
5	- Free Topic		WONJIN KWAK	Lecture		Watching a recorded video lecture / Real-time video feedback (zoom)
6	Electric double layer		WONJIN KWAK	Lecture		Watching a recorded video lecture / Real-time video feedback (zoom)
7	Summary & Rehearsal		WONJIN KWAK	Lecture		Summary and Rehearsal

< Class Schedule >

* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
8	Mid-term Exam		WONJIN KWAK	Exam	Face-to-face or Non-face-to-face	Face-to-face (medical questionnaire) / Non-face-to-face (video system and printer)
9	- Recent study in EMSDL		WONJIN KWAK	Lecture		Watching a recorded video lecture / Real-time video feedback (zoom)
10	Electrochemical Kinetics (Charge Transfer)		WONJIN KWAK	Lecture		Watching a recorded video lecture / Real-time video feedback (zoom)
11	Electrochemical Kinetics (Mass Transfer)		WONJIN KWAK	Lecture		Watching a recorded video lecture / Real-time video feedback (zoom)
12	Hydrodynamic methods		WONJIN KWAK	Lecture		Watching a recorded video lecture / Real-time video feedback (zoom)
13	Electrochemical Measurements		WONJIN KWAK	Lecture		Watching a recorded video lecture / Real-time video feedback (zoom)
14	Electric Vehicles		WONJIN KWAK	Lecture		Watching a recorded video lecture / Real-time video feedback (zoom)

< Class Schedule >

* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
15	Summary & Rehearsal		WONJIN KWAK	Lecture		Summary and Rehearsal
16	Final Exam		WONJIN KWAK	Exam	Face-to-face or Non-face-to-face	Face-to-face (medical questionnaire) / Non-face-to-face (video system and printer)

11. Other items of notification

Please note that the lecture progress plan and schedule may change due to the spread of the COVID 19. If there are any changes, I will notify you through announcements and real-time feedback. Please send requirements to wjkwak@ajou.ac.kr for better lecture. I will try to reflect it as much as possible. For inquiries about career counseling, please contact Prof. Kwak via the above email address.

※코로나19 확산 예방을 위한 출석인정 공지

- 출석인정대상 : 2020-1학기 재학생 중 코로나19 바이러스로 인한 자가격리자 (중국을 다녀온 학생, 감염증 증상 보유자), 입국지연자 및 감염증 의심증상 학생
- 출석인정기간 : 입국 이후 14일간(자가격리기간), 바이러스로 인한 입국지연기간 및 감염증 의심증상에 대한 치료기간 (학사운영규칙에 따라 출석인정기간은 최대 4주 이내로 제한, 그 이상의 기간이 소요될 경우 휴학 권고)
- 출석인정 증빙서류: 자가격리자, 감염증 의심증상 학생:
출입국기록 확인서, 진료확인서, 의사 소견서, 의사 진단서, 처방전 제출 (택 1) / 입국지연자: 출입국기록 확인서 제출