

教學大綱(Syllabus)-研究所

系務會議通過修訂日期：2007/9/12

updated:2007/10/04

課程編碼 (course no.)	D004			學分 (credits)	3	
課程名稱 (course name)	(中) 電極動力學					
	(Eng.) Electrode Kinetics					
開課系所班級 (dept. & year)	材料科學與工程學系博士班一年級 (Dept. of Mat. Sci. & Engr., Ph.D)		授課教師 (teacher)	顏秀崗 教授 (Prof. Shiow-Kang Yen)		
課程類別 (course type)	選修 (Elective)	授課語言 (language)	中文 (Chinese)	開課學期 (semester)	上學期 (Fall)	
課程簡述 (course description)	<p>(中) 希望藉修習此課程使同學對電化學反應之電極動力學有更深入之了解，以熱力學、動力學(質傳及界面反應)為基礎，探討電位、電流與時間之關係。習得本課程後將可應用於燃料電池、鋰電池、電化學合成、電解沉積、電鍍及腐蝕各領域之分析與研究。</p> <p>(Eng.) This course provides the fundamental science of electrode kinetics in electrochemistry. Based on thermodynamics, kinetics (mass transport and interfacial reaction), the correlations among potential (V), current (I), and time (t) are analyzed. It will be helpful for the analyses and the applications of fuel cells, Li ion cells, electrochemical syntheses, electrolytic deposition, and corrosion.</p>					
課程目標 (course objectives)	<p>(中)</p> <ol style="list-style-type: none"> 1. 電極電化學反應過程簡介 2. 了解電化學中的熱力學,電勢,電荷傳遞動力學和質傳 3. 了解固定電位與掃描電位分析 4. 了解固定電流與掃描電流分析 5. 了解交流阻抗及模擬電路分析 <p>(Eng.)</p> <ol style="list-style-type: none"> 1. Introduction and Overview of Electrode processes 2. Potentials and Thermodynamics of Cells 3. Kinetics of Electrode Reactions 4. Mass Transfer by Migration and Diffusion 5. Controlled Potential Microelectrode Techniques Potential Step Controlled Potential Microelectrode Techniques Potential Sweep Methods 					
先修課程(prerequisites)						
課程編碼 (course no.)	課程名稱 (course name)	與課程銜接的重要概念、原理與技能 (relation to the current course)				
教學模式 (teaching methodology)	模式 (methodology)	講授 (teaching)	討論/報告 (discussion & report)	實驗/參訪 (exp./fab visit)	遠距/網路教學 (remote/web teaching)	合計 (sum)

學分分配 (credit distrib.)	3				3
授課時數分配 (hour distrib.)	3				3



授課進度與內容 (週次、單元名稱與內容、習作/考試進度、備註) (course content and homework/tests schedule)			
週次 (week)	單元名稱與內容 (subject and content)	習作/考試進度 (homework and tests)	備註 (remark)
01	Introduction and Overview of	3-5 exercises	
02	Electrode Processes		
03	Potentials and Thermodynamics of		
04	Cells		
05	Kinetics of Electrode Reactions		
06			
07	Mass Transfer by Migration and		
08	Diffusion		
09	Midterm Examination		
10	Basic Potential Step Methods	Reading related J.	
11		Papers	
12	Potential Sweep Methods	Reading related J.	
13		Papers	
14	Controlled-Current Techniques	Reading related J.	
15		Papers	
16	Techniques Based on Concepts of	Reading related J.	
17	Impedance	Papers	
18	Terminal Examination		
學習評量方式 (evaluation)			
1. Midterm Examination: 50% (期中考試: 習作佔 60%, 其他內容佔 40%)			
2. Terminal Examination: 50% (期末考試: 習作佔 70%, 期刊論文佔 30%)			
Examination: 目的在評估學生對課堂講授內容的了解程度, 並且培養同學平日課後複習的習慣以及思考問題的能力。			
教科書 (書名、作者、書局、代理商、說明) (textbook)			
"Electrochemical Methods, Fundamentals and Applications" 2nd ed., J. Bard and L. R. Faulkner, John Wiley & Son, Inc.(2001)			
參考書目 (書名、作者、書局、代理商、說明) (other references)			
J. O'M. Bockris and A. K. N. Reddy, "Modern Electrochemistry" Vol. 1, Plenum Publishing (1977)			
課程教材 (教師個人網址請列在本校內之網址。) (teaching aids & teacher's website)			
Projection slide files or power point files.			



與學系教育目標之關聯性(材料系)
(relation to educational objective of materials engineering department)

1. 提供材料性質、製程與應用及跨領域知識與訓練
To provide interdisciplinary know-how and training on materials properties, processing, and applications
2. 培育具獨立思考、創新與實作能力之材料科技人才
To train materials technology students for independent thinking, innovation, and practical skills
3. 培養團隊合作精神與溝通協調整合能力
To cultivate the spirit of teamwork and the capacity of integrated cooperation
4. 建立多元價值與國際觀
To inculcate multifarious values and cosmopolitan worldview
5. 強化綠色材料科技教育
To implement educational programs in eco-materials technology

與學系教育核心能力之關聯性(材料系)
(relation to educational core abilities for materials engineering department)

- (A) 特定材料之專業知識
Specialized knowledge in Materials science and Engineering
- (B) 策劃及執行專題研究之能力
Ability to plan and execute a research project
- (C) 撰寫專業論文之能力
Ability to write journal articles
- (D) 創新思考及獨立解決問題之能力
Ability to do innovative thinking and independent problem solving
- (E) 跨領域協調整合之能力
Ability to work in an interdisciplinary setting
- (F) 國際觀及綠色材料意識
A fine international scope and general concept of eco-material
- (G) 領導、管理及規劃之能力
Ability in leadership, management, and organization
- (H) 終身自我學習成長之能力
Ability for life-long learning
- (I) 學術專業倫理
Professional ethics in Science and Engineering

課程內涵達成學系【教育目標】比對資料

授課進度與內容	教育目標				
	目標一	目標二	目標三	目標四	目標五
提供材料性質、製程與應用及跨領域知識與訓練	培育具獨立思考、創新與實作能力之材料科技人才	培養團隊合作精神與溝通協調整合能力	建立多元價值與國際觀	強調綠色材料科技教育	
請勾選關聯性 <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Introduction and Overview of Electrode Processes	1	0	0	1	1
Potentials and Thermodynamics of Cells	1	1	0	1	1
Kinetics of Electrode Reactions	1	1	0	1	1
Mass Transfer by Migration and Diffusion	1	1	1	1	0
Basic Potential Step Methods	1	1	1	1	1
Potential Sweep Methods	1	1	1	1	1
Controlled-Current Techniques	1	1	1	1	1
Techniques Based on Concepts of Impedance	1	1	0	1	1
總計(%)	100%	88%	50%	100%	88%

- 註：
1. 所有必修課均須填寫此表。
 2. 矩陣中請填入關聯性； 1 表示相關，0 表示無相關。
 3. 學系教育目標項次請依據表1填寫。



課程內涵達成學系【核心能力】比對資料(研究所)

授課進度與內容	核心能力								
	A 特定材料之專業知識	B 策劃及執行專題研究之能力	C 撰寫專業論文之能力	D 創新思考及獨立解決問題之能力	E 跨領域協調整合之能力	F 國際觀及綠色材料意識	G 領導、管理及規劃之能力	H 終身自我學習成長之能力	I 學術專業倫理
請勾選關聯性 <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Introduction and Overview of Electrode Processes	1	1	1	1	1	1	1	1	1
Potentials and Thermodynamics of Cells	1	1	1	1	1	1	1	1	1
Kinetics of Electrode Reactions	1	1	1	1	1	1	1	1	1
Mass Transfer by Migration and Diffusion	1	1	1	1	1	1	1	1	1
Basic Potential Step Methods	1	1	1	1	1	1	1	1	1
Potential Sweep Methods	1	1	1	1	1	1	1	1	1
Controlled-Current Techniques	1	1	1	1	1	1	1	1	1
Techniques Based on Concepts of Impedance	1	1	1	1	1	1	1	1	1
總計(%)	100%	100%	100%	100%	100%	100%	100%	100%	100%

- 註：
1. 所有必修課均須填寫此表。
 2. 矩陣中請填入關聯性； 1 表示相關，0 表示無相關。
 3. 學系教育目標項次請依據表1填寫。