國立中興大學教學大綱(Syllabus)-研究所

系務會議通過修訂日期：2010/1/13
updated: (year)/(month)/(day)

課程名稱 (course name)	(中) M005 實用電子顯微鏡				
	(Eng.) M005 Practical Electron Microscopy				
開課系所班級 (dept. & year)	材料科學與工程學系碩士班一年級 (Dept. of Mat. Sci. & Eng., Master)	**學分 (credits)**	3	**授課教師 (teacher)**	薛富盛 教授 (Prof. Fuh-Sheng Shieu)
課程類別 (course type)	□必修(Mandatory) □選修(Elective)	**授課語言 (language)**	中文 (Chinese)	**開課學期 (semester)**	下學期 (Spring)
課程目標 (course objectives)	(中) 訓練學生穿透式電子顯微鏡的操作與試片的準備，讓其可應用此技術於材料分析與研究上。				
	(Eng.) To provide students the opportunity of learning the operation of TEM and its application in materials characterization and research.				
課程簡述 (course description)	(中) 學生修習電子顯微鏡原理之後，為讓其進一步了解如何操作及使用穿透式電子顯微鏡於材料分析上的應用，從試片準備到儀器校正，針對不同材料樣品的觀察，提供學生研究材料組織與微結構的分析能力。				
	(Eng.) After learning the fundamentals of transmission electron microscopy (TEM), the students will have the opportunity to practice the operation of an electron microscope. Different topics will be covered, including sample preparation and the instrument alignments.				

先修課程(prerequisites)

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) 【請勾選】	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)
	●	●	●	

授課內容（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	The instrument of TEM		
02	Sample preparations		
03	Lab 1: preparation methods		
04	Lab 1: preparation methods		
05	Lab 2: TEM alignments		
06	Lab 2: TEM alignments		
07	Lab 3: Al foil		
08	Lab 3: Al foil		
09	X-ray spectrometry		
10		Prelim	
11	Lab 4: Au thin film		
12	Lab 4: Au thin film		
13	Lab 5: Clay/polymer composite		
14	Lab 5: Clay/polymer composite		
15	Lab 6: Analytical TEM		
16	Lab 6: Analytical TEM		
17	Electron energy-loss spectroscopy		
18		Final exam	

學習評量方式
(evaluation)

實驗報告(50%)、期中考(20%)、期末考(30%)。

教科書&參考書目（書名、作者、書局、代理商、說明）
(textbook& other references)

Transmission Electron Microscopy, David B. Williams and C. Barry Carter, Plenum Press, New York 2009

1. L. Reimer, *Transmission Electron Microscopy; Physics of Image Formation and Microanalysis*, 3rd edition, Springer-Verlag, New York 1993
2. P. B. Hirsch, A. Howie, R. B. Nicholson, D. W. Pashley and M. J. Whelan, *Electron Microscopy of Thin Crystals*, 2nd edition, Krieger, Huntington, New York 1977
3. J. W. Edington, *Practical Electron Microscopy in Materials Science*, Van Nostrand Reinhold, New York 1976
4. P. J. Goodhew, *Specimen Preparation for Transmission Electron Microscopy of Materials*, Oxford University Press, New York 1984

L. C. Sawyer and D. T. Grubb, *Polymer Microscopy*, 2nd edition, Chapman & Hall, New York 1996

課程教材（教師個人網址請列在本校內之網址。）
(teaching aids & teacher's website)

http://audi.nchu.edu.tw/~fsshieu/
課程輔導時間 (office hours)

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【核心能力】比對資料(研究所)

授課進度與內容	核心能力								
	A	B	C	D	E	F	G	H	I
	特定材料之專業知識	策劃及執行專題研究之能力	撰寫專業論文之能力	創新思考及獨立解決問題之能力	跨領域協調整合之能力	國際觀及綠色材料意識	領導、管理及規劃之能力	終身自我學習成長之能力	學術專業倫理
請勾選關聯性☑	☑	☑	☐	☐	☐	☑	☐	☑	☐
The instrument of TEM	1	0	0	0	0	0	0	1	0
Sample preparations	1	0	0	0	0	1	0	1	0
Lab 1: preparation methods	1	1	0	0	0	0	0	0	0
Lab 2: TEM alignments	1	1	0	0	0	0	0	0	0
Lab 3: Al foil	1	1	0	0	0	0	0	0	0
X-ray spectrometry	1	0	0	0	0	0	0	1	0
Lab 4: Au thin film	1	1	0	0	0	0	0	0	0
Lab 5: Clay/polymer composite	1	1	0	0	0	1	0	0	0
Lab 6: Analytical TEM	1	1	0	0	0	0	0	0	0
Electron energy-loss spectroscopy	1	0	0	0	0	0	0	1	0
總計(%)	100%	60%	0%	0%	0%	20%	0%	40%	0%

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。