

明志科技大學課程綱要表

課程名稱：穿透式電子顯微鏡實務		開課單位	化工所		
Transmission Electron Microscopy Practice		課程代碼			
授課教師：李國通					
學分數	3	必/選修	選修	開課年級	能源電池科技博士班
先修科目或先備能力：材料科學導論、基礎英文閱讀					
<p>課程概述與目標：本課程使用英文教科書用以增進學生英文閱讀能力，另以應用電子顯微鏡分析所發表之研究文獻或報告為教材。本課程主要講授掃描式電子顯微鏡、穿透式電子顯微鏡的操作原理、儀器構造、定性及定量分析及相關應用技術。學生修畢本課程後，應可對電子顯微鏡有較詳盡之瞭解，有助於學生在研究論文或未來職場，利用電子顯微鏡於研究物料或化工產品的材料組織、化學成份、顯微結構等實務分析工作。另外，本課程在授課中會提出一些實務問題與學生討論，培養學生具有溝通協調能力及創新思考能力，並能掌握國際產業及綠能科技方向，為終身學習奠定基礎。</p>					
教科書 ¹	David B. Williams and C. Barry Carter, Transmission Electron Microscopy, Plenum Press, New York (1996)				
課程綱要		核心能力達成	對應之學生核心能力		
單元主題	內容綱要	指標			
Introduction to EM	1. Why use electrons? 2. Limitation of EM	1,2,3,4,5,6,7	1.瞭解各種電子顯微鏡的綠能科技知識。2.能閱讀與思考相關之論文或技術報告。3.課堂參與討論，瞭解綠色科技方向。		
Scattering and Diffraction	1. Why interested in electron scattering? 2. Elastic and inelastic scattering	1,2,3,4,5,6,7	1.瞭解高速電子與材料作用的綠能知識。2.能閱讀與思考相關之論文或技術報告。3.課堂參與討論，瞭解綠色科技方向。		
EM Instruments	1. Illumination system 2. Objective lenses and stage 3. Forming DPs and Images 4. Alignment and stigmatism	1,2,3,4,5,6,7	1.瞭解電子顯微鏡裝置等綠能知識。2.能閱讀與思考相關之論文或技術報告。3.課堂參與討論，瞭解綠色科技方向。		

Diffraction in TEM	1. Why use diffraction? 2. Reciprocal space 3. Scattering from crystals 3. Indexing diffraction patterns 4. Kikuchi diffraction	1,2,3,4,5,6,7	1.瞭解穿透式電子顯微鏡的繞射分析等綠能知識。2.能閱讀與思考相關之論文或技術報告。3.課堂參與討論，瞭解綠色科技方向。
Specimen Preparation	1. Self-supporting disk 2. Specimen on grids 3. Cross-section specimen	1,2,3,4,5,6,7	1.瞭解電子顯微鏡試片製備等綠能知識。2.能閱讀與思考相關之論文或技術報告。3.課堂參與討論，瞭解綠色科技方向。
SEM and TEM Practice	1. Specimen Preparation 2. SEM analyses 3. TEM analyses	1,2,3,4,5,6,7	1.實際準備電鏡試片及實務操作掃描式電子顯微鏡及穿透式電子顯微鏡等綠色技能。2.能閱讀與思考相關之論文或技術報告。3.課堂參與討論，瞭解綠色科技方向。

教學要點概述²：

參考教材：

材料電子顯微鏡學，陳力俊等，國科會精儀中心，1994。

教學方法：

本課程講授電子顯微鏡之相關理論、設備及應用，教學包含課堂實務講授與學生個別實作。

評量方法：

(1)平時成績: 40%

(2)實作成績: 30%

(3)期末考試: 30%

教學相關配合事項：

可透過網路大學學習平台取得課程輔助教材及授課相關資料。

註：1.教科書請註明書名、作者、出版社、出版年等資訊。

2.教學要點概述請填寫教材編選、教學方法、評量方法、教學資源、教學相關配合事項等。

3.學系所有開設之課程皆須填寫此表格或提供原有格式之課程綱要表。若能蒐集校際所開設課程，如共同必修科目、通識課程等之課程綱要表，亦可提供。

COURSE SYLLABUS

Course Title : Transmission Electron Microscopy Practice				
Credits / Hours	3/3	Course Number		<input type="checkbox"/> Required <input checked="" type="checkbox"/> Elective
Brief Course Description & Curriculum Objective:				
<p>For improving the students' English ability and practical skills, this course uses English textbook and also uses some published academic or industrial reports using electron microscopy analyses as the teaching materials. This course includes some general and precious Scanning Electron Microscopy analysis and Transmission Electron Microscopy analysis, and their relative principles, equipment configuration, qualitative and quantitative methods, and related technologies. After completion of this course, the students shall have a more detail understanding on Electron Microscopy and this course will also help them in the future to apply the instrument to analyst the material constituents, chemical compositions, and micro-structures for materials in school researches and future work. In addition, the curriculum taught in each topic will include the current development of the instrument application and the actual discussion of the relative issues with students, which can train students the ability to think independently and built up the basis for their lifelong learning.</p>				
Course Topics				
Topic		Content		
Introduction to EM		<ol style="list-style-type: none"> 1. Why use electrons? 2. Limitation of EM 		
Scattering and Diffraction		<ol style="list-style-type: none"> 1. Why interested in electron scattering? 2. Elastic and inelastic scattering 		
EM Instruments		<ol style="list-style-type: none"> 1. Illumination system 2. Objective lenses and stage 3. Forming DPs and Images 4. Alignment and stigmatism 		
Diffraction in TEM		<ol style="list-style-type: none"> 1. Why use diffraction? 2. Reciprocal space 3. Scattering from crystals 3. Indexing diffraction patterns 4. Kikuchi diffraction 		
Specimen Preparation		<ol style="list-style-type: none"> 1. Self-supporting disk 2. Specimen on grids 3. Cross-section specimen 		
SEM and TEM Practice		<ol style="list-style-type: none"> 1. Specimen Preparation 2. SEM analyses 3. TEM analyses 		