



## 33 教學大綱(Syllabus)-研究所

updated: 2010/08/26

課程編碼 (course no.)	N940410			學分 (credits)	3
課程名稱 (course name)	(中) 高等物理冶金				
	(Eng.) Advanced Physical Metallurgy				
開課系所班級 (dept. & year)	材料科學與工程學系碩士班 (Dept. of Mat. Sci. & Eng., Master)			授課教師 (teacher)	張守一 教授 (Prof. Shou-Yi Chang)
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) 本課程講述物理冶金重要知識，針對材料結構、差排、塑性變形、晶界、空孔、退火、固溶體及相、擴散行為、凝固與析出、成長與孕核、變形雙晶與麻田散反應等內容做一詳細介紹，使學生能建立材料科學之基礎知識，並進一步將所學與未來相關研究結合。此課程為以課堂授課為主，並將另外安排教學助理時間，針對作業進行討論。</p> <p>(Eng.) This course introduces the important knowledge of physical metallurgy. The structure of materials, dislocations, plastic deformation, grain boundaries, vacancies, annealing, solid solutions and phases, diffusion, solidification and precipitation, nucleation and growth, and deformation twinning and martensite reaction are stated in detail. The objective of this course is to establish the basic knowledge of materials science for the students and to further connect the knowledge to related future researches. This course is a lecture-oriented course. Teaching assistant's time will be arranged for the discussion of homework.</p>				
課程目標 (course objectives)	<p>(中)</p> <ol style="list-style-type: none"> <li>1. 瞭解材料之結構與差排結構</li> <li>2. 瞭解材料之塑性變形</li> <li>3. 瞭解材料之晶界與空孔結構</li> <li>4. 瞭解退火處理與其影響</li> <li>5. 瞭解固溶體與相平衡圖</li> <li>6. 瞭解擴散行為</li> <li>7. 瞭解凝固與析出之成長與孕核</li> <li>8. 瞭解變形雙晶與麻田散反應</li> <li>9. 培養學生解決問題的能力</li> <li>10. 培養學生收集資料的能力</li> <li>11. 培養同學書面報告的能力</li> <li>12. 培養同學團隊合作精神</li> </ol> <p>(Eng.)</p> <ol style="list-style-type: none"> <li>1. To understand the structure of materials and dislocations</li> <li>2. To understand the plastic deformation of materials</li> <li>3. To understand grain boundaries and vacancies in materials</li> <li>4. To understand annealing treatment and its effects</li> <li>5. To understand solid solution structures and phase diagrams</li> <li>6. To understand the diffusion in solid solutions</li> <li>7. To understand the nucleation and growth in solidification and precipitation</li> <li>8. To understand deformation twinning and martensite reactions</li> <li>9. To cultivate the capability of problem solving</li> <li>10. To cultivate the capability of information collection</li> <li>11. To cultivate the capability of presentation</li> <li>12. To cultivate the spirit of teamwork</li> </ol>				



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.)	3.0				3.0
	授課時數分配 (hour distrib.)	3.0				3.0
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	Crystal Structures					
02	Introduction to Dislocations					
03	Dislocations and Plastic Deformation		Homework			
04	Grain Boundaries					
05	Vacancies					
06	Annealing		Homework			
07	Solid Solutions					
08	Phases					
09	Midterm Examination		Midterm Examination			
10	Binary Phase Diagrams					
11	Substitutional Diffusion					
12	Interstitial Diffusion		Homework			
13	Solidification of Metals					
14	Nucleation and Growth Kinetics					
15	Precipitation Hardening		Homework			
16	Deformation Twinning					
17	Martensite Reactions					
18	Final Examination		Final Examination			
學習評量方式 (evaluation)						
(1) Midterm Examination: 40%						
(2) Final Examination: 50%						
(3) Homework: 10%						

**期中考試 (Midterm Examination) :**

期中考試之目的主要在於評量學生對課堂講授資料的了解程度，培養同學課後複習的習慣以及思考問題的能力，並且作為課程內容調整之依據。

**期末考試 (Final Examination) :**

期末考試之目的主要在於評量學生對課堂講授資料的了解程度，培養同學課後複習的習慣以及思考問題的能力，並且作為課程內容調整之依據。

**作業 (Homework) :**

針對課程章節安排作業，其主要目的在於提供學生自我學習的機會，可讓學生更加熟悉課程內容，並培養學生蒐集整理資料以及分析解決問題的能力，同時可培養學生撰寫報告的能力。

**教科書 (書名、作者、書局、代理商、說明)  
(textbook)**

1. "Physical Metallurgy Principles", R.E. Reed-Hill and R. Abbaschian, 3rd edition, PWS Publishing Co., 1994.

**參考書目 (書名、作者、書局、代理商、說明)  
(other references)**

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

Power Point Files  
<http://www.mse.nchu.edu.tw/>



**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 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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Crystal Structures	1	1	0	1	0	0	0	1	1
Introduction to Dislocations	1	1	0	1	0	0	0	1	0
Dislocations and Plastic Deformation (Homework)	1	1	1	1	1	0	0	1	0
Grain Boundaries	1	1	0	1	0	0	0	1	0
Vacancies	1	1	0	1	0	0	0	1	0
Annealing (Homework)	1	1	1	1	1	0	0	1	0
Solid Solutions	1	1	0	1	0	0	0	1	0
Phases	1	1	0	1	0	1	0	1	1
Midterm Examination	1	1	0	1	0	0	0	1	0
Binary Phase Diagrams	1	1	0	1	0	1	0	1	1
Substitutional Diffusion	1	1	0	1	0	0	0	1	0
Interstitial Diffusion (Homework)	1	1	1	1	1	0	0	1	0
Solidification of Metals	1	1	0	1	0	0	0	1	0
Nucleation and Growth Kinetics	1	1	0	1	0	0	0	1	0
Precipitation Hardening (Homework)	1	1	1	1	1	0	0	1	0
Deformation Twinning	1	1	0	1	0	0	0	1	0
Martensite Reactions	1	1	0	1	0	0	0	1	0
Final Examination	1	1	0	1	0	0	0	1	0
總計(%)	21 (%)	21 (%)	5 (%)	21 (%)	5 (%)	2 (%)	0 (%)	21 (%)	4 (%)

- 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。