教學大綱(Syllabus)-研究所

系務會議通過修訂日期：2007/9/12
updated: 2007/10/12

課程編碼 (course no.)	D008			**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材料所博士班 1 年級 (Dept. of Mat. Sci. & Engr.,Ph.D)			**授課教師 (teacher)**	汪俊延 副教授 (Associate Prof. Jun Yen Uan)
課程類別 (course type)	選修 (Elective)	**授課語言 (language)**	英文 (English)	**開課學期 (semester)**	上學期 (Fall)
課程簡述 (course description)	(中) 材料科學為工程教育的重要科技，材料的性質與特性，於現代工程設計中佔有相當重要的地位。本課程開始於材料內部結晶結構課題，進而延伸至差排理論、塑性變形、空孔、休梅-若塞瑞定則等，以便於充分了解金屬材料特性上的理論基礎。以這些材料物理冶金知識為基礎，藉以解釋近年來材料發展新發現之原理。				
	(English) Properties and characteristics of materials play important role in modern engineering design. The undergraduate course will focus on the following topics, including basis of crystallography, dislocation, grain and grain boundary, plastic deformation, vacancies, hume - rothery rule, setc. Moreover, there have been some importantdevelopments in materials science, particularly in nano-materials and its processing.It is the objective of this course to build up students fundamental concepts and thusother new developments could be explained in terms of the basic principles of physical metallurgy.				
課程目標 (course objectives)	(中) 1.瞭解材料之結構與分析方法 2.了解金屬材料結晶構造對性質之影響 3.瞭解材料之塑性變形行為與機制 4.學習差排理論 5.瞭解材料內部之晶界與空孔結構 6.學習休梅-若塞瑞定則				
	(English) 1.Learn the effect of crystal structure on property of material 2. To understand the structure of materials and analytical methods 3. To understand the plastic deformation of materials 4.Learn the theory of dislocation 5. To understand grain boundaries and vacancies in materials 6.Learn the theory of hume - rothery rule				

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	The Structure of Metals – Crystal Structure		
02	The Structure of Metals – Standard Projections		
03	Analytical Methods – X-Ray Diffraction		
04	Analytical Methods – Microscopy		
05	Crystal Binding		
06	Introduction to Dislocations – Dislocation Structures		
07	Introduction to Dislocations– Stress Field and Strain Energy		
08	Dislocations and Plastic Deformation – Slip		
09	Midterm Examination		
10	Dislocations and Plastic Deformation – Plastic Deformation		
11	Grain Boundaries – Stress Field and Energy		
12	Grain Boundaries – Twist and Tilt Boundaries		
13	Vacancies		
14	Annealing – Recovery and Recrystallization		
15	Annealing – Grain Growth		
16	Solid Solutions		
17	Phases		
18	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)

YSICAL METALLURGY PRINCIPLES, 3th Ed, ROBERT E. REED-HILL;REZA ABBASCHIAN,PWS PUBLISHING COMPANY
物理冶金的課程講授將取自於" PHYSICAL METALLURGY PRINCIPLES"。由於必須不斷的補充新教材，因此，大部分授課內容將取自於授課老師自行編寫整理的講義。

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

1.ndamentals of Physical Metallurgy, JOHN D. VERHOEVEN,JOHN WILEY & SONS,lnc.
2.troduction to Dislocations, 3th Ed, D. Hull and D.J. Bacon, BUTTERWORTH HEINEMANN

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://web.nchu.edu.tw/~jyuan/c/I.htm

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 提供材料性質、製程與應用及跨領域知識與訓練	目標二 培育具獨立思考、創新與實作能力之材料科技人才	目標三 培養團隊合作精神與溝通協調整合能力	目標四 建立多元價值與國際觀	目標五 強調綠色材料科技教育
請勾選關聯性☑	☑	☑	☐	☐	☑
The Structure of Metals – Crystal Structure	1	1	0	0	0
The Structure of Metals – Standard Projections	1	1	0	0	0
Analytical Methods – X-Ray Diffraction	1	1	0	0	0
Analytical Methods – Microscopy	1	1	0	0	0
Crystal Binding	1	1	0	0	0
Introduction to Dislocations – Dislocation Structures	1	1	0	0	0
Introduction to Dislocations– Stress Field and Strain Energy	1	1	0	0	0
Dislocations and Plastic Deformation – Slip	1	1	0	0	0
Midterm Examination	1	1	0	0	0
Dislocations and Plastic Deformation – Plastic Deformation	1	1	0	0	0
Grain Boundaries – Stress Field and Energy	1	1	0	0	0
Grain Boundaries – Twist and Tilt Boundaries	1	1	0	0	0
Vacancies	1	1	0	0	0
Annealing – Recovery and Recrystallization	1	1	0	0	1
Annealing – Grain Growth	1	1	0	0	1
Solid Solutions	1	1	0	0	1
Phases	1	1	0	0	1
Final Examination	1	1	0	0	1
總計(%)	100 (%)	100 (%)	0(%)	0 (%)	28(%)

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☑	☑	☑	☑	☐	☑	☑	☑	☑	☑
The Structure of Metals – Crystal Structure	1	1	0	0	0	1	0	1	0
The Structure of Metals – Standard Projections	1	1	0	0	1	1	0	1	0
Analytical Methods – X-Ray Diffraction	1	1	1	0	0	1	0	1	1
Analytical Methods – Microscopy	1	1	1	0	1	1	0	1	1
Crystal Binding	1	1	0	0	1	1	0	1	0
Introduction to Dislocations – Dislocation Structures	1	1	0	0	0	1	0	1	0
Introduction to Dislocations– Stress Field and Strain Energy	1	1	0	0	1	1	0	1	0
Dislocations and Plastic Deformation – Slip	1	1	0	0	0	1	0	1	0
Midterm Examination	1	1	0	0	0	1	0	1	0
Dislocations and Plastic Deformation – Plastic Deformation	1	1	0	0	1	1	0	1	0
Grain Boundaries – Stress Field and Energy	11	1	0	0	0	1	0	1	0
Grain Boundaries – Twist and Tilt Boundaries	1	1	0	0	1	1	0	1	0
Vacancies	1	1	0	0	1	1	0	1	0
Annealing – Recovery and Recrystallization	1	1	0	0	0	1	0	1	0
Annealing – Grain Growth	1	1	1	0	1	1	1	1	0
Solid Solutions	1	1	1	0	1	1	1	1	0
Phases	1	1	1	0	1	1	1	1	0
Final Examination	1	1	0	0	0	1	1	1	0
總計(%)	100%	100%	28%	0%	61%	100%	22%	100%	11%

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。