



國立中興大學教學大綱(Syllabus)-大學部

系務會議通過修訂日期：2010/1/13
updated: 2011/02/15

課程名稱 (course name)	(中) U004 物理冶金 (下)																
	(Eng.) U004 Physical Metallurgy (II)																
開課系所班級 (dept. & year)	材料科學與工程 學系 大學部二年級 (Dept. Mat. Sci. Eng., Sophomore)	學分 (credits)	3	授課教師 (teacher)	張守一 教授 (Shou-Yi Chang, Professor)												
課程類別 (course type)	<input checked="" type="checkbox"/> 必修(Mandatory) <input type="checkbox"/> 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)	<p>(中)</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">1. 瞭解材料之相平衡圖</td> <td style="width: 50%;">2. 瞭解固溶體內部之擴散行為</td> </tr> <tr> <td>3. 瞭解凝固與析出之成長與孕核</td> <td>4. 瞭解變形雙晶與麻田散反應之機制</td> </tr> <tr> <td>5. 瞭解鐵碳合金系統</td> <td>6. 瞭解鋼鐵之硬化行為與處理</td> </tr> <tr> <td>7. 認識非鐵金屬</td> <td>8. 培養學生解決問題的能力</td> </tr> <tr> <td>9. 培養學生收集資料的能力</td> <td>10. 培養同學書面報告的能力</td> </tr> <tr> <td>11. 培養同學團隊合作精神</td> <td></td> </tr> </table> <p>(Eng.)</p> <ol style="list-style-type: none"> 1. To understand phase diagrams of materials 2. To understand the diffusion in solid solutions 3. To understand the nucleation and growth in solidification and precipitation 4. To understand deformation twinning and martensite reactions 5. To understand the iron-carbon alloy system 6. To understand the hardening of steel 7. To understand nonferrous alloy systems 8. To cultivate the capability of problem solving 9. To cultivate the capability of information collection 10. To cultivate the capability of presentation 11. To cultivate the spirit of teamwork 					1. 瞭解材料之相平衡圖	2. 瞭解固溶體內部之擴散行為	3. 瞭解凝固與析出之成長與孕核	4. 瞭解變形雙晶與麻田散反應之機制	5. 瞭解鐵碳合金系統	6. 瞭解鋼鐵之硬化行為與處理	7. 認識非鐵金屬	8. 培養學生解決問題的能力	9. 培養學生收集資料的能力	10. 培養同學書面報告的能力	11. 培養同學團隊合作精神	
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課程簡述 (course description)	<p>(中) 本課程講述物理冶金重要知識，針對相平衡圖、擴散行為、凝固與析出、成長與孕核、變形雙晶與麻田散反應、鐵碳合金系統、鋼鐵硬化及非鐵金屬等內容，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. Phase diagrams, diffusion in solids, solidification and precipitation, nucleation and growth, deformation twinning and martensite, iron-carbon alloy system, hardening of steel, and nonferrous alloy systems 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>																



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	Binary Phase Diagrams		
02	Diffusion in Substitutional Solid Solutions – Theories		
03	Diffusion in Substitutional Solid Solutions – Self Diffusion	Homework	
04	Interstitial Diffusion		
05	Solidification of Metals – Nucleation and Growth		
06	Solidification of Metals – Dendritic Growth and Segregation	Homework	
07	Nucleation and Growth Kinetics		
08	Precipitation Hardening	Homework	
09	Midterm Examination	Midterm Examination	
10	Deformation Twinning		
11	Martensite Reactions		
12	The Iron-Carbon Alloy System – Iron-Carbon Diagram	Homework	
13	The Iron-Carbon Alloy System – Transformation		
14	The Hardening of Steel – Hardenability		
15	The Hardening of Steel – Heat Treatments	Homework	
16	Selected Nonferrous Alloy Systems – Copper and Aluminum Alloys		
17	Selected Nonferrous Alloy Systems – Other Alloys		
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&參考書目 (書名、作者、書局、代理商、說明)
(textbook & other references)**

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

**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/>

**課程輔導時間
(office hours)**

星期一、二、四、五 下午 4 點至 5 點



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) 運用數學、科學及材料工程知識能力
Ability to apply knowledge of mathematics, science, and materials engineering
- (B) 設計與執行材料實驗及分析數據之能力
Ability to design and conduct experiments, as well as analyze data
- (C) 執行材料工程實務所需之技術與能力
Ability to use techniques and skills for materials engineering practices
- (D) 製程整合及及元件實作之能力
Ability to integrate process and make devices
- (E) 溝通協調之能力與團隊合作之精神
Ability to communicate effectively and cultivate the spirit of teamwork
- (F) 獨立思考及解決問題之能力
Ability to think independently and solve problems
- (G) 培養國際觀及認識綠色材料對全球環境的影響
Cultivation of cosmopolitan worldview and understanding effects of eco-materials on global environment
- (H) 終身學習之習慣與能力
Ability to cultivate life-long learning habit
- (I) 瞭解材料工程人員的社會責任與專業倫理
Understanding materials engineers' social responsibility and professional ethics

課程內涵達成學系【核心能力】比對資料(大學部)

授課進度與內容	核心能力								
	A	B	C	D	E	F	G	H	I
	運用數學、科學及材料工程知識能力	設計與執行材料實驗及分析數據之能力	執行材料工程實務所需之技術與能力	製程整合及元件實作之能力	溝通協調之能力與團隊合作之精神	獨立思考及解決問題之能力	培養國際觀及認識綠色材料對全球環境的影響	終身學習之習慣與能力	瞭解材料工程人員的社會責任與專業倫理
請勾選關聯性 <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Binary Phase Diagrams	1	1	1	0	0	1	0	1	0
Diffusion in Substitutional Solid Solutions – Theories	1	1	0	0	0	1	0	1	0
Diffusion in Substitutional Solid Solutions – Self Diffusion (Homework)	1	1	0	0	1	1	0	1	0
Interstitial Diffusion	1	1	0	0	0	1	0	1	0
Solidification of Metals – Nucleation and Growth	1	1	1	0	0	1	0	1	0
Solidification of Metals – Dendritic Growth and Segregation (Homework)	1	1	1	0	1	1	0	1	0
Nucleation and Growth Kinetics	1	1	0	0	0	1	0	1	0
Precipitation Hardening (Homework)	1	1	1	0	1	1	0	1	0
Midterm Examination	1	1	0	0	0	1	0	1	0
Deformation Twinning	1	1	0	0	0	1	0	1	0
Martensite Reactions	1	1	0	0	0	1	0	1	0
The Iron-Carbon Alloy System – Iron-Carbon Diagram (Homework)	1	1	0	0	1	1	0	1	0
The Iron-Carbon Alloy System – Transformation	1	1	0	0	0	1	0	1	0
The Hardening of Steel – Hardenability	1	1	1	0	0	1	0	1	0
The Hardening of Steel – Heat Treatments (Homework)	1	1	1	0	1	1	0	1	0
Selected Nonferrous Alloy Systems – Copper and Aluminum Alloys	1	1	0	0	0	1	1	1	1
Selected Nonferrous Alloy Systems – Other Alloys	1	1	0	0	0	1	1	1	1
Final Examination	1	1	0	0	0	1	0	1	0
總計 (%)	100%	100%	33%	0%	28%	100%	11%	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。