

教學大綱(Syllabus)-研究所

updated: 2008/08/18

課程編碼 (course no.)	M014			學分 (credits)	3
課程名稱 (course name)	(中) 相變化				
	(Eng.) Phase Transformation				
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 副教授 (Shou-Yi Chang, Associate Professor)
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) 本課程講述瞭解相變化的熱力學理論、晶體化學與結晶學、界面結構、以及動力學理論，並針對相的孕核與成長機制、凝固之相變化機制、以及包括離相分解及麻田散等特殊之相變化型態加以介紹說明。本課程之目的在使學生能建立相變化基本知識，可進一步將研究中所觀察之相變化行為與理論機制加以結合。此課程為以課堂授課為主，並針對相關內容進行期中及期末評量。</p> <p>(Eng.) This course introduces the thermodynamics, crystal chemistry and crystallography, interfaces, and kinetics of phase transformation. The nucleation and growth mechanisms, phase transition during solidification, and some special types of phase transformation including Spinodal Deposition and Martensitic transformation are also stated. The objective of this course is to establish the fundamental knowledge of phase transformation for the students and to further connect the observed phase transformation behavior to the theoretical mechanisms in researches. This course is a lecture-oriented course and has midterm and final examinations as evaluation.</p>				
課程目標 (course objectives)	<p>(中)</p> <ol style="list-style-type: none"> 1. 瞭解相變化的熱力學理論 2. 瞭解相變化的晶體化學與結晶學 3. 瞭解相變化的界面結構 4. 瞭解相變化的動力學理論 5. 瞭解相的孕核與成長機制 6. 瞭解凝固之相變化機制 7. 瞭解特殊之相變化型態 8. 培養學生解決問題的能力 9. 培養學生收集資料的能力 <p>(Eng.)</p> <ol style="list-style-type: none"> 1. To understand thermodynamics of phase transformation 2. To understand crystal chemistry and crystallography of phase transformation 3. To understand interface structures of phase transformation 4. To understand kinetics of phase transformation 5. To understand nucleation and growth of phases 6. To understand phase transformation of solidification 7. To understand the types of phase transformation 8. To cultivate the capability of problem solving 9. To cultivate the capability of information collection 				

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	0	0	3
	授課時數分配 (hour distrib.)	3	0	0	0	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	Introduction					
02	Thermodynamics – Phase Equilibrium					
03	Thermodynamics – Phase rule					
04	Crystal Chemistry					
05	Crystallography					
06	Interfaces – Structures					
07	Interfaces – Interface Equilibrium					
08	Kinetics					
09	Midterm Examination	Midterm Examination				
10	Nucleation – Homogeneous					
11	Nucleation – Heterogeneous					
12	Growth – Single Systems					
13	Growth – Binary Systems					
14	Liquid-Solid Phase Transformation					
15	Spinodal Decomposition					
16	Martensitic Transformation					
17	Deposition of Thin Films					
18	Final Examination	Final Examination				
學習評量方式 (evaluation)						
(1) Midterm Examination: 50%						
(2) Final Examination: 50%						

**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。

教科書 (書名、作者、書局、代理商、說明)**(textbook)**

1. “Phase Transformations in Metals and Alloys”, D.A. Porter and K.E. Easterling, Van Nostrand Reinold Co., 1981

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

1. “Phase Transformations in Materials”, A.K. Jena and M.C. Chaturvedi, Prentice- Hall Inc., 1992.
2. “Phase Transitions in Solid”, C.N.R. Rao and K.J. Rao, Magraw-Hill, 1978.

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

Scripts

<http://web.nchu.edu.tw/~shouyi/>



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 <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Introduction	1	1	0	0	0
Thermodynamics – Phase Equilibrium	1	1	0	0	0
Thermodynamics – Phase rule	1	1	0	0	0
Crystal Chemistry	1	1	0	0	0
Crystallography	1	1	0	0	0
Interfaces – Structures	1	1	0	0	0
Interfaces – Interface Equilibrium	1	1	0	0	0
Kinetics	1	1	0	0	0
Midterm Examination	1	1	0	0	0
Nucleation – Homogeneous	1	1	0	0	0
Nucleation – Heterogeneous	1	1	0	0	0
Growth – Single Systems	1	1	0	0	0
Growth – Binary Systems	1	1	0	0	0
Liquid-Solid Phase Transformation	1	1	0	0	0
Spinodal Decomposition	1	1	0	0	0
Martensitic Transformation	1	1	0	0	0
Deposition of Thin Films	1	1	0	0	0
Final Examination	1	1	0	0	0
總計(%)	50%	50%	0%	0%	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。
 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 <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"/>
Introduction	1	1	1	1	0	0	0	1	1
Thermodynamics – Phase Equilibrium	1	0	0	1	0	0	0	0	0
Thermodynamics – Phase rule	1	0	0	1	0	0	0	0	0
Crystal Chemistry	1	0	0	1	0	0	0	0	0
Crystallography	1	0	0	1	0	0	0	0	0
Interfaces – Structures	1	0	0	1	0	0	0	0	0
Interfaces – Interface Equilibrium	1	0	0	1	0	0	0	0	0
Kinetics	1	0	0	1	0	0	0	0	0
Midterm Examination	1	1	1	1	0	0	0	1	1
Nucleation – Homogeneous	1	0	0	1	0	0	0	0	0
Nucleation – Heterogeneous	1	0	0	1	0	0	0	0	0
Growth – Single Systems	1	0	0	1	0	0	0	0	0
Growth – Binary Systems	1	0	0	1	0	0	0	0	0
Liquid-Solid Phase Transformation	1	0	0	1	0	0	0	0	0
Spinodal Decomposition	1	0	0	1	0	0	0	0	0
Martensitic Transformation	1	0	0	1	0	0	0	0	0
Deposition of Thin Films	1	0	0	1	0	0	0	0	0
Final Examination	1	1	1	1	0	0	0	1	1
總計(%)	38%	6%	6%	38%	0%	0%	0%	6%	6%

- 註：
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 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。