

課程名稱 (course name)	(中) 表面工程 (U042)				
	(Eng.) Surface Engineering				
開課系所班級 (dept. & year)	材料系大學部	學分 (credits)	3	授課教師 (teacher)	張立信
課程類別 (course type)	<input type="checkbox"/> 必修(Mandatory) <input checked="" type="checkbox"/> 選修(Elective)	授課語言 (language)	中文	開課學期 (semester)	下學期
課程簡述 (course description)	(中) 調整材料表面的狀態是獲得所需材料特性的重要概念之一。在本課程中，將表面改質技術分為兩大類，分別探討其原理、優缺點、硬體設計與材料應用等。第一類為表面處理技術，此類技術著眼於原表面之性質調整，包括離子佈植、電子束處理與雷射處理。另一類為鍍膜技術，是在原表面之上鍍著異質塗層，包括熱熔射、蒸鍍、濺鍍之物理氣相沉積與化學氣相沉積。基礎知識，包括真空技術、電漿物理與表面科學將在課程一開始先行複習。				
	(Eng.) The modification of surface condition is one of the critical concepts in gaining the materials with specific properties. The principle, benefits and shortcomings, hardware design and materials applications of surface modification techniques are introduced in two main categories. One is the surface treatment technology in which the properties of original surface are modified. This includes the ion implantation, electron beam treatment and laser treatment. The other is the coating technology in which a new layer with the required properties is overlaid on the original surface. The thermal spraying, evaporation and sputtering deposition, and chemical vapor deposition belong to this category. Some basic knowledge including vacuum technology, plasma physics and surface science will be reviewed briefly at the beginning of this course.				
先修課程名稱 (prerequisites)					
課程目標與核心能力關聯配比(%) (relevance of course objectives and core learning outcomes)				教學方法與評量方法 (teaching and assessment methods)	
課程目標(中/ Eng.)		核心能力	配比	教學方法	評量方法
1. 能知道表面工程之發展背景與緣由 (To know the background and reason for the development of surface engineering)		■1.運用數學、科學及材料工程知識能力	50%	講授	測驗 作業
2. 能了解表面工程各種技術的工作原理 (To understand the working principles of various techniques in surface engineering)		■2.設計與執行材料實驗及分析數據之能力	15%		
3. 能分析各種技術之製程參數影響 (To analysis the influences of process parameters in various techniques)		■3.執行材料工程實務所需之技術與能力	35%		
4. 能由原理推論出各種技術之優缺點 (To tell the advantages and drawbacks of various techniques from principles)		<input type="checkbox"/> 4.製程整合及元件實作之能力			
5. 能判斷各種技術之材料限制與工作對象 (To tell the materials limitations and objectives of various techniques)		<input type="checkbox"/> 5.溝通協調之能力與團隊合作之精神			
6. 能判斷各種技術之材料限制與工作對象 (To tell the materials limitations and objectives of various techniques)					

7. 能知道各種技術的應用，包括現況與可能性 (To know the applications of various techniques, incl. status and possibility)	<input type="checkbox"/> 6.獨立思考、解決問題、終身學習之習慣與能力		
8. 能熟練運用表面工程相關公式 (To be familiar with the formula used in surface engineering)	<input type="checkbox"/> 7.培養國際觀及認識綠色材料對全球環境的影響		
9. 能分析可能發生之表面工程問題，並提出合理解決方法 (To analysis possible problems in surface engineering and propose reasonable solutions)	<input type="checkbox"/> 8.瞭解材料工程人員的社會責任與專業倫理		
10. 養成課後複習與參閱相關書籍的學習習慣 (To cultivate the learning habit in reviewing and studying literature after course)			

**授課內容(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 (Course content)	習作/考試進度 (Homework/tests schedule)
01	簡介 (Introduction)	
02	真空技術 (Vacuum Technology)	
03	電漿物理 (Plasma Physics)	
04	表面科學 (Surface Science)	習作 1 (Homework 1)
05	離子佈植 (Ion Implantation)	
06	電子束處理 (Electron Beam Treatment)	
07	雷射處理 (Laser Treatment)	習作 2 (Homework 2)
08	習作檢討 (Homework Review)	
09	期中考 (Midterm)	
10	電漿熔射 (Thermal Spaying)	
11	蒸鍍 (Evaporation Deposition)	
12	濺鍍 (Sputtering Deposition)	
13	濺鍍 (Sputtering Deposition)	習作 3 (Homework 3)
14	化學氣相沉積 (Chemical Vapor Deposition)	
15	化學氣相沉積 (Chemical Vapor Deposition)	
16	化學氣相沉積 (Chemical Vapor Deposition)	習作 4 (Homework 4)
17	習作檢討 (Homework Review)	
18	期末考 (Final Exam)	

**學習評量方式
(evaluation)**

- 學期成績依照以下比例計算 (The percentages for calculating the final score):
 - 期末考試(Final): 30%
 - 期中考試(Midterm): 30%
 - 課後作業(Homework): 40%
- 考試 (Examinations):

所有考試(期中、期末考)均配合學校考試時程舉辦。考試範圍包含所有上課講授內容。學生可於考試期間參考任何文獻(open book)。

(All exams (midterm, final exam) are carried out according to the semester schedule. The ranges of exams include all materials taught in the lecture. Students are allowed to refer to any literature (open book) during examination.)
- 作業 (Homework):

作業依照進度每次指定 10 題。學生需於一週內完成並於次週上課時繳交。作業問題將於課堂中討論。學生將被隨機指派上講台解釋其答案。

(10 problems are assigned in homework as scheduled each time. Students should finish the homework within one week and submit it in the next course. The problems in homework are discussed during the lecture. Students are occasionally designated to explain their answers on the platform.)

教科書&參考書目 (書名、作者、書局、代理商、說明)
(textbook& other references)

教科書(Textbook)

授課教師自編講義 (Handout)

參考書目 (References)

1. Burakowski, T. and Wierzchon, T., Surface Engineering of Metals, CRC Press, Boca Raton, 1999
2. Eckertova, L., Physics of Thin Films, Plenum Press, NY, 1990
3. Elshabini-Riad, A. and Barlow III, F.D., Thin Film Technology Handbook, McGraw-Hill, Singapore, 1998
4. Rickerby, D.S. and Matthews, A. (ed.), Advanced Surface Coatings: A Handbook of Surface Engineering, Blackie & Son, London, 1991
5. Schuegraf, K.K. (ed.), Handbook of Thin Film Deposition Processes and Techniques, Noyes Pub., NJ, 1988
6. Wachtman, J.B. and Haber, R.A. (ed.) Ceramic Films and Coatings, Noyes Pub., NJ, 1993
7. Wagendristel, A and Wang, Y., An Introduction to Physics and Technology of Thin Films, World Scientific, Singapore, 1994
8. 丁南宏等人，真空技術與應用，中華民國國科會精儀中心，新竹市，2001
9. 白木靖寬與吉田貞史(編著)(王建義譯)，薄膜工程學，全華，2004
10. 岩井善弘與越石健司(趙中興編譯)，平面顯示器的關鍵元件、材料技術，全華，2005
11. 柯賢文(編著)，表面與薄膜處理技術，全華，2005
12. 羅吉宗(編著)，薄膜科技與應用，全華，2004

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://www.mse.nchu.edu.tw/course/super_pages.php?ID=course1

課程輔導時間(office hours) 學期間每週二下午 4:00-5:00 (Tuesday, 04:00-05:00 pm)