國立中正大學機械工程學系 114 學年度第 1 學期教學大綱表

Syllabus for the first semester of the 114 academic year of the Department of Mechanical Engineering, National Chung Cheng University

課程名稱：(中文) 電子封裝力學概論 (英文) Fundamental Mechanics of Electronic Packaging					開課單位	前瞻碩/博士學程&機械工程研究所
					課程代碼	4205308
Professor	黃北辰 Huang, Pei-Chen	credits	3	選修	開課年級	MS/PhD
全英文授課 EMI	■是 □否					
Prerequisites or Prerequisites: General Physics, Material Mechanics, Engineering Materials						
Course Overview: The major education goal is the introduction on development roadmap of electronic packaging technology, and related mechanical reliability issues with analysis methods. Moreover, the testing standard of electronic packaging is also introduced to train the fundamental theories and analysis ability of students.						
Textbook	1. J. H. Lau, C. P. Wong, J. L. Prince, Electronic Packaging: Design, Materials, Process, and Reliability, McGraw-Hill Professional, 1998. 2. S. Liu, Y. Liu, Modeling and Simulation for Microelectronic Packaging Assembly: Manufacturing, Reliability and Testing, John Wiley & Sons, 2011. 「請尊重智慧財產權，不得非法影印教師指定之教科書籍」					
教學要點概述						
教材編選 teaching materials	■ 自製簡報(ppt) □課程講義 □自編教科書 □ 教學程式 □自製教學影片 □其他					
教學方法 teaching methods	■講述 □小組討論 □學生口頭報告 □問題導向學習 □個案研究 □其他					
評量工具 Evaluation tools	■期中考 □期末考 □隨堂測驗 □隨堂作業 ■課後作業 □期中報告 ■期末報告 □專題報告 □評量尺規 □其他					
教學資源 teaching resources	■課程網站 ■教材電子檔供下載 □實習網站					
教師相關訊息 instructor's information	黃北辰老師現職為國立中正大學前瞻碩博士學程/機械系合聘教授，於半導體電子封裝領域力學可靠度研究深耕多年，並已發表 13 篇相關期刊論文著作。					

Course Outline		分配時數				可達成核心能力
Unit Topic	Content	講授	示範	習作	其他[1]	

Introduction	1. Basic concept of electronic packaging 2. Development roadmap 3. Engineering case	9				D1, D2, D3, D4
Wire bonding and die attach technique	1. Wire bonding 2. Die attach process	6				D1, D2, D3, D4
Flip-chip and wafer level packaging technique	1. Flip-chip process 2. Intermetallic compound 3. Wafer level packaging	9				D1, D2, D3, D4
3D packaging technique	1. Concept of 2.1/2.3/2.5/3D IC 2. Heterogeneous integration technique	9				D1, D2, D3, D4
Fan-out type and panel-level packaging technique	1. Fan-in/Fan-out packaging 2. Panel-level packaging and its reliability issue	9				D1, D2, D3, D4
Si/glass-based interposer and metal-filled through vias technique	1. Interposer and through vias material system 2. Thermo-mechanical and keep out zone issues	6				D1, D2, D3, D4

可達成核心能力		核心能力達成指標
D1	具力學視角解析電子封裝領域議題之專業知識	能從不同電子封裝結構組件間因材料系統熱-機械性質差異而導致力學問題進行分析之實務能力培養
D2	以力學視角策劃及執行電子封裝相關領域專題研究之能力	從課程中包含之各類具代表性封裝結構，如焊點與中介層之設計改變可能導致之力學行為進行探討與分析，以此知曉電子封裝載具結構設計實務上可能遭遇之機械力學分析議題並培養實務解決能力
D3	撰寫科技論文與簡報之能力	能從封裝載具之熱-機械力學行為辨認出關鍵受力結構組件，針對組件材料使用合適的力學理論與本構模型進行分析，並基於學理與分析結果撰寫專業論文之能力
D4	創新思考及獨立解決電子封裝領域力學問題之能力	建立以封裝載具熱-機械力學行為解析技術為核心之創新思考與實務問題解決能力，為相關產業廠商開發新載具與增進載具力學可靠率/良率打下深厚基礎

教學要點概述:

Class Time	Class Location	Evaluation method	Office hour	Teaching quality evaluation method
Thursday PM 14:10-17:00 (星期四, 8, 9, 10節)	創新大樓 105	Homework 30% Mid-term exam 30% (In class) Final report 40%	Friday: AM 10:00-11:30 Room 432C mail:pchuang@ccu.edu.tw	Teaching opinions survey

週次	教　學　與　作　業　進　度	備　註

1	Introduction of electronic packaging technology	
2	Evaluation and roadmap of electronic packaging	
3	Wire bonding technique	
4	Die attach process	
5	Flip chip process	HW#1 Technical report about electronic packaging, due in mid-term exam
6	Evaluation of solder joint material and process	
7	Intermetallic compound generation mechanism and behavior	
8	Wafer level packaging technique	
9	Mid-term exam	Hand in HW#1
10	Concept of 2.1/2.3/2.5/3D IC	
11	Heterogeneous integration technique	
12	Fan-in/Fan-out packaging	
13	Panel-level packaging and its reliability issue	
14	Interposer and through vias material system	
15	Thermo-mechanical and keep out zone issues	
16	Case study on surveying technical report of specific topic	Announce topic for final report
17, 18	Final examine	