# 教學大綱(Syllabus)-大學部

系務會議通過修訂日期：2008/01/03
updated: 2008/01/16

<table>
<tr><td>課程編碼<br>(course no.)</td><td colspan="3">U034</td><td>學分<br>(credits)</td><td>3</td></tr>
<tr><td rowspan="2">課程名稱<br>(course name)</td><td colspan="5">(中) 電子構裝</td></tr>
<tr><td colspan="5">(Eng.) Electronic Packaging</td></tr>
<tr><td>開課系所班級<br>(dept. & year)</td><td colspan="3">材料科學與工程學系 大學部四年級<br>(Dept. of Mat. Sci. Eng., Senior)</td><td>授課教師<br>(teacher)</td><td>張守一 副教授<br>(Shou-Yi Chang, Associate Professor)</td></tr>
<tr><td>課程類別<br>(course type)</td><td>選修<br>(optional)</td><td>授課語言<br>(language)</td><td>中文<br>(Chinese)</td><td>開課學期<br>(semester)</td><td>下學期<br>(Spring)</td></tr>
<tr><td rowspan="2">課程簡述<br>(course description)</td><td colspan="5">(中) 本課程講述電子構裝之技術及應用，主要內容包括：<br>1. 電子構裝所使用之材料及其性質<br>2. 電子構裝所需考量之特性要求，包括電性質、熱性質以及機械性質等<br>3. 傳統及先進電子構裝技術<br>4. 電子構裝製程方法<br>5. 銲錫技術<br>6. 表面黏裝技術及晶片尺寸封裝<br>7. 封裝可靠度及未來發展趨勢<br>本課程以課堂授課為主，並要求學生針對相關題目進行期末報告。</td></tr>
<tr><td colspan="5">(Eng.) This course introduces the technologies and applications of electronic packaging. Main topics of this course include:<br>1. Electronic packaging materials and their properties<br>2. Specific considerations of electronic packaging, including electrical, thermal, and mechanical properties<br>3. Conventional and advanced packaging technologies<br>4. Processing methods of electronic packaging<br>5. Solder technology<br>6. Surface mount technology and chip scale packaging<br>7. Reliability and future trend of electronic packaging<br>This course is a lecture-oriented course and requires students to give a midterm presentation and a final report in related topics.</td></tr>
<tr><td rowspan="2">課程目標<br>(course objectives)</td><td colspan="5">(中) 本課程之目標在於使學生能瞭解電子構裝之技術及應用，熟悉電子構裝所使用之材料以及所需考量之特性要求，並瞭解傳統及先進之電子構裝技術、製程方法、銲錫技術，以及未來發展趨勢等主題。期望透過本課程能使學生能建立電子構裝相關之知識，並進一步將所學與產業應用結合；同時訓練學生解決問題、收集資料以及報告之能力，並透過小組活動培養團隊合作之精神。</td></tr>
<tr><td colspan="5">(Eng.) The objectives of this course are to introduce the technologies and applications of electronic packaging to the students. This course is for the students to understand packaging materials, specific considerations, conventional and advanced packaging technologies, processing methods, solder technology, and future trend of electronic packaging, etc. The objectives of this course are to establish the knowledge of electronic packaging and to further connect the knowledge to industrial applications.</td></tr>
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| | |
|---|---|
| | In addition, this course will also establish the abilities to solve problems, to collect information, to present, and to cultivate the spirit of teamwork for the students. |

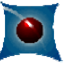
**先修課程(prerequisites)**

| 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.) | 2.5 | 0.5 | | | 3 |
| | 授課時數分配 (hour distrib.) | 2.5 | 0.5 | | | 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 to Electronic Packaging | | |
| 02 | Packaging Materials –Important Packaging Material Properties | | |
| 03 | Packaging Materials – Ceramics, Plastics, and Metals in Packaging | | |
| 04 | Electrical Design Considerations | | |
| 05 | Thermal Design Considerations | | |
| 06 | Mechanical Design Considerations | | |
| 07 | Packaging and Interconnection of ICs – Conventional Technologies | | |
| 08 | Packaging and Interconnection of ICs – Advanced Technologies | | |
| 09 | Midterm Examination | Midterm Examination | |
| 10 | Processing Technologies – Ceramic and Thin film Processing | | |
| 11 | Processing Technologies – Package IC Assembly Processes | | |
| 12 | Solder Technologies – Solder Materials and Solder Paste | | |
| 13 | Solder Technologies – Soldering | | |

| | | | |
|---|---|---|---|
| | Methodology and Solderability | | |
| 14 | Surface Mount Technologies | | |
| 15 | Chip Scale Packaging and Direct Chip Attach Technologies | | |
| 16 | Printed Wiring Board and Thermal Conduction Module | | |
| 17 | Reliability and Testing, Analytical Techniques, and Future Trends | | |
| 18 | Final Presentation | Final Presentation | |

**學習評量方式**
**(evaluation)**

(1) Midterm Examination: 50%
(2) Final Presentation: 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。

期末報告（Final Presentation）：
以小組為單位，選定課程相關的主題進行資料的蒐集與整理，於學期末提出報告。目的是要提供學生自我學習的機會，培養學生蒐集、整理及分析資料的能力，並訓練學生表達與溝通的能力。並將期末報告內容整理成書面資料，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)**

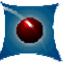
1. “Advanced Electronic Packaging: with Emphasis on Multichip Modules”, edited by W.D. Brown, IEEE Press, 1999.
2. “微系統封裝原理與技術”，邱碧秀，滄海書局，2004。

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

1. “Electronic Packaging: Design, Materials, Process, and Reliability”, J. Lau, C.P. Wong, J.L. Prince, W. Nakayama, McGraw-Hill Inc., 1998.
2. “Electronic Packaging and Interconnection Handbook”, 3rd edition, edited by C.A. Harper, McGraw-Hill Inc., 2000.
3. “Electronic Packaging: Materials and Their Properties”, M.G. Pecht, CRC Press LLC, 1999.

**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://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) 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【教育目標】比對資料

| 授課進度與內容 | 教育目標 | | | | |
|---|---|---|---|---|---|
| | 目標一<br>提供材料性質、製程與應用及跨領域知識與訓練 | 目標二<br>培育具獨立思考、創新與實作能力之材料科技人才 | 目標三<br>培養團隊合作精神與溝通協調整合能力 | 目標四<br>建立多元價值與國際觀 | 目標五<br>強調綠色材料科技教育 |
| 請勾選關聯性☑ | ☑ | ☑ | ☑ | ☑ | ☑ |
| Introduction to Electronic Packaging | 1 | 0 | 0 | 1 | 1 |
| Packaging Materials –Important Packaging Material Properties | 1 | 0 | 0 | 1 | 1 |
| Packaging Materials – Ceramics, Plastics, and Metals in Packaging | 1 | 0 | 0 | 1 | 1 |
| Electrical Design Considerations | 1 | 1 | 0 | 0 | 0 |
| Thermal Design Considerations | 1 | 1 | 0 | 0 | 0 |
| Mechanical Design Considerations | 1 | 1 | 0 | 0 | 0 |
| Packaging and Interconnection of ICs – Conventional Technologies | 1 | 1 | 0 | 0 | 0 |
| Packaging and Interconnection of ICs – Advanced Technologies | 1 | 1 | 0 | 0 | 0 |
| Midterm Examination | 1 | 1 | 0 | 0 | 0 |
| Processing Technologies – Ceramic and Thin film Processing | 1 | 1 | 0 | 0 | 0 |
| Processing Technologies – Package IC Assembly Processes | 1 | 1 | 0 | 0 | 0 |
| Solder Technologies – Solder Materials and Solder Paste | 1 | 1 | 0 | 0 | 1 |
| Solder Technologies – Soldering Methodology and Solderability | 1 | 1 | 0 | 0 | 1 |
| Surface Mount Technologies | 1 | 1 | 0 | 0 | 1 |
| Chip Scale Packaging and Direct Chip Attach Technologies | 1 | 1 | 0 | 0 | 1 |
| Printed Wiring Board and Thermal Conduction Module | 1 | 1 | 0 | 0 | 0 |
| Reliability and Testing, Analytical Techniques, and Future Trends | 1 | 1 | 0 | 1 | 1 |
| Final Presentation | 1 | 1 | 1 | 1 | 1 |
| 總計(%) | 38 (%) | 31 (%) | 2 (%) | 10 (%) | 19 (%) |

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(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☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ |
| Introduction to Electronic Packaging | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| Packaging Materials –Important Packaging Material Properties | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Packaging Materials – Ceramics, Plastics, and Metals in Packaging | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Electrical Design Considerations | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| Thermal Design Considerations | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| Mechanical Design Considerations | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| Packaging and Interconnection of ICs – Conventional Technologies | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| Packaging and Interconnection of ICs – Advanced Technologies | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| Midterm Examination | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| Processing Technologies – Ceramic and Thin film Processing | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| Processing Technologies – Package IC Assembly Processes | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| Solder Technologies – Solder Materials and Solder Paste | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| Solder Technologies – Soldering Methodology and Solderability | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| Surface Mount Technologies | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| Chip Scale Packaging and Direct Chip Attach Technologies | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| Printed Wiring Board and Thermal Conduction Module | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| Reliability and Testing, Analytical Techniques, and Future Trends | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |
| Final Presentation | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |
| 總計(%) | 21 (%) | 21 (%) | 16 (%) | 7 (%) | 1 (%) | 17 (%) | 10 (%) | 5 (%) | 2 (%) |

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。