



教學大綱(Syllabus)-大學部

系務會議通過日期：2007/09/12

updated: 2007/09/28

| | | | | | |
|------------------------------|---|--------------------|-----------------|--------------------|---|
| 課程編碼 (course no.) | U036 | | | 學分 (credits) | 3 |
| 課程名稱 (course name) | (中) 複合材料 | | | | |
| | (Eng.) Composite Materials | | | | |
| 開課系所班級 (dept. & year) | 材料科學與工程學系大學部四年級 (Dept. of Mat. Sci. & Engr., Senior) | | | 授課教師 (teacher) | 張守一 副教授 (Associate Prof. Shou-Yi Chang) |
| 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) 本課程講述複合材料之種類、組成材料、界面與結構，以及其製程技術原理，並針對複合材料之機械、電、熱等性質及其應用領域，做一詳細介紹，使學生能建立研究所需之基本知識，並進一步將所學與產業應用結合。此課程為以課堂授課為主，並要求學生針對相關題目進行期末報告。</p> <p>(Eng.) This course introduces the types, component materials, interface, structures and processing technologies of composites materials. The properties of composite materials, including mechanical, electrical, and thermal characteristics, and their application fields are stated in detail. The objective of this course is to establish the basic knowledge of related researches for the students and to further connect the knowledge to industrial applications. This course is a lecture-oriented course and requires students to give a final presentation in related topics.</p> | | | | |
| 課程目標 (course objectives) | <p>(中)</p> <ol style="list-style-type: none"> 1. 瞭解複合材料的基本特性 2. 瞭解複合材料的組成 3. 瞭解複合材料的界面結構 4. 瞭解各種形式之複合材料 5. 瞭解複合材料的力學特性 6. 瞭解複合材料的性質 7. 瞭解複合材料的應用及發展 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. 培養同學書面和口頭報告的能力 11. 培養同學團隊合作精神 <p>(Eng.)</p> <ol style="list-style-type: none"> 1. To understand the basic properties of composite materials 2. To understand the components of composite materials 3. To understand the interface structures of composite materials 4. To understand every types of composite materials 5. To understand the mechanics of composite materials 6. To understand the properties of composite materials 7. To understand the applications and developments of composite materials 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 | | | | |

| 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 | | | | | |
| 02 | Reinforcements – Glass Fibers, Carbon Fibers, Organic Fibers | | | | | |
| 03 | Reinforcements – Ceramic Fibers, Metallic Fibers, Whiskers | | | | | |
| 04 | Matrix Materials – Polymers, Metals, Ceramics | | | | | |
| 05 | Interfaces | | | | | |
| 06 | Polymer Matrix Composites | | | | | |
| 07 | Metal Matrix Composites – Processing and Interfaces | | | | | |
| 08 | Metal Matrix Composites – Properties and Applications | | | | | |
| 09 | Midterm Examination | | Midterm Examination | | | |
| 10 | Ceramic Matrix Composites | | | | | |
| 11 | Carbon Fiber Composites and Other Composites | | | | | |
| 12 | Micromechanics of Composites | | | | | |
| 13 | Macromechanics of Composites | | | | | |
| 14 | Strength and Fracture of Composites | | | | | |
| 15 | Thermal Expansion Behavior of Composites | | | | | |
| 16 | Electrical Conductivity of Composites | | | | | |
| 17 | Arc Erosion Behavior of Composites | | | | | |
| 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)**

“Composite Materials – Science and Engineering”, 2nd edition, K.K. Chawla, Springer-Verlag, New York, 1998.

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



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 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"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Reinforcements – Glass Fibers, Carbon Fibers, Organic Fibers | 1 | 1 | 0 | 0 | 0 |
| Reinforcements – Ceramic Fibers, Metallic Fibers, Whiskers | 1 | 1 | 0 | 0 | 0 |
| Matrix Materials – Polymers, Metals, Ceramics | 1 | 1 | 0 | 0 | 0 |
| Interfaces | 1 | 1 | 0 | 0 | 0 |
| Polymer Matrix Composites | 1 | 1 | 0 | 1 | 1 |
| Metal Matrix Composites – Processing and Interfaces | 1 | 1 | 0 | 1 | 1 |
| Metal Matrix Composites – Properties and Applications | 1 | 1 | 0 | 1 | 1 |
| Midterm Examination | 1 | 1 | 0 | 0 | 0 |
| Ceramic Matrix Composites | 1 | 1 | 0 | 1 | 1 |
| Carbon Fiber Composites and Other Composites | 1 | 1 | 0 | 1 | 1 |
| Micromechanics of Composites | 1 | 1 | 0 | 0 | 0 |
| Macromechanics of Composites | 1 | 1 | 0 | 0 | 0 |
| Strength and Fracture of Composites | 1 | 1 | 0 | 0 | 0 |
| Thermal Expansion Behavior of Composites | 1 | 1 | 0 | 0 | 0 |
| Electrical Conductivity of Composites | 1 | 1 | 0 | 0 | 0 |
| Arc Erosion Behavior of Composites | 1 | 1 | 0 | 0 | 0 |
| Final Presentation | 1 | 1 | 1 | 0 | 0 |
| 總計(%) | 38 (%) | 38 (%) | 2 (%) | 11 (%) | 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。
 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 <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"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Reinforcements – Glass Fibers, Carbon Fibers, Organic Fibers | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |
| Reinforcements – Ceramic Fibers, Metallic Fibers, Whiskers | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |
| Matrix Materials – Polymers, Metals, Ceramics | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |
| Interfaces | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |
| Polymer Matrix Composites | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| Metal Matrix Composites – Processing and Interfaces | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| Metal Matrix Composites – Properties and Applications | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| Midterm Examination | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| Ceramic Matrix Composites | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| Carbon Fiber Composites and Other Composites | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| Micromechanics of Composites | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| Macromechanics of Composites | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| Strength and Fracture of Composites | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| Thermal Expansion Behavior of Composites | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| Electrical Conductivity of Composites | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| Arc Erosion Behavior of Composites | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| Final Presentation | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| 總計(%) | 20 (%) | 20 (%) | 15 (%) | 0 (%) | 1 (%) | 9 (%) | 10 (%) | 20 (%) | 5 (%) |

- 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。