



課程科號

11420

CSR5109

# 超高能隙半導體概論

(英文授課)

Course Title

# Introduction to Ultra Wide Bandgap Semiconductors

## Course Information (Offered in English) >>>>>

This course teaches graduate students to learn Ultra-Wide Bandgap Semiconductors (UWBGs) with bandgap energy higher than that of SiC. UWBGs includes diamond, gallium oxide, aluminum nitride, and boron nitride, of which material properties, synthesis technology, and applications to very high-voltage, high-power, and radiation hard sensors and electronic devices will be discussed.

### 課程亮點

課程時段 114-2學期 星期二 13:20~16:20

- 超寬能隙半導體前瞻
- 鑽石半導體核心技術
- 極限散熱與高熱通量管理
- 新興材料 × 真實製程 × 元件應用
- AI 輔助前瞻研究訓練

### 教授簡介 >>>>>



Instructor | 曾永華 特聘教授 Tzeng, Yon-Hua

- 國立清華大學半導體研究學院元件部專任特聘教授
- 專精於半導體鑽石的製造、鑽石與化合物半導體、矽晶片的異質整合
- IEEE終身會士與奈米技術委員會主席
- 美國國家發明家科學院 (NAI) 院士



課程科號

11420

CSR5414

# 半導體薄膜沉積技術

(英文授課)

Course Title

# Semiconductor Thin Film Deposition Techniques

## Course Information (Offered in English) >>>>>

This course will cover common thin film deposition techniques used in semiconductor manufacturing, including their principles, mechanisms, applications, and characterization methods. We'll start with front-end-of-line (FEOL) processes, such as epitaxial growth for source and drain regions, the preparation of gate dielectric thin films, and metal electrode deposition. We'll then move on to back-end-of-line (BEOL) metallic interconnects and the thin film materials for non-volatile memory devices. Beyond these mature processes, the course will also explore the thin film preparation of emerging semiconductor materials like III-V compounds, 2D materials, and oxide semiconductors.

## 課程亮點

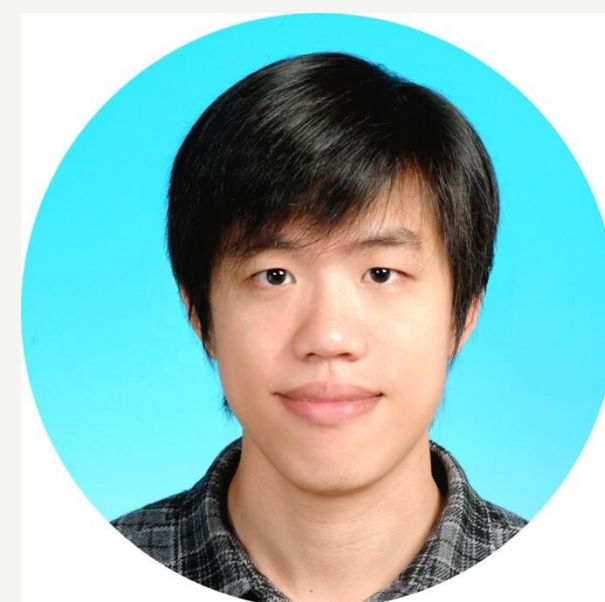
課程時段 114-2學期 星期二 09:00~12:00

- 製程整合 × 材料應用
- PVD / CVD / ALD 核心原理全解析進階
- 薄膜缺陷、應力、厚度量測完整介紹
- 前瞻材料 ( FeRAM 、 2D ) 沉積與趨勢
- 強化真實製程判讀能力

## 教授簡介 >>>>>

Instructor | 李愷信 教授 LI, KAI-SHIN

- 國立清華大學半導體研究學院製程研發部專任教授
- 專精於先進薄膜製程、製程整合與非揮發性記憶體
- FinFET / 2D / MRAM 關鍵技術平台開發
- RRAM 全球最小 1×3 nm<sup>2</sup> breakthrough





課程科號

11420

CSR5415

# 電漿蝕刻原理及製程技術

(英文授課)

Course Title

# Plasma Etching Principal and Process Technology

## Course Information (Offered in English) >>>>>

Introductory course on plasma etch principle, focusing on the low-temperature plasma physics used for plasma etch process and generic plasma etch chamber functionality. Also include plasma etch process development and applications, focusing on the real application examples for plasma process parameter selection and the problem solving principal practice in a production environment.

### 課程亮點

課程時段 114-2學期

星期一 13:20~15:10 & 星期四 13:20~14:10

- 從電漿蝕刻原理到製程實戰
- 真實 Fab 電漿製程案例導向
- 電漿參數選擇 × 製程除錯全解析
- 建立製程工程師的邏輯判斷力
- 強化國際半導體職場即戰力

### 教授簡介 >>>>>



Instructor | 馬紹銘 教授 Ma, Shaw-Ming

- 國立清華大學半導體研究學院製程研發部專任教授
- 專精於電漿蝕刻製程、電漿設備與製程研發
- 30+ 年美國半導體製程與設備產業管理



課程科號

11420

CSR5416

# 先進半導體製程技術

Course Title

# Advanced Semiconductor Process Technology

## Course Information (Offered in Chinese) >>>>>

This course provides a comprehensive overview of semiconductor process technologies with a focus on advanced techniques used in integrated circuit (IC) manufacturing. Key topics include lithography, etching, thin-film deposition, ion implantation, chemical mechanical polishing (CMP), and metallization. To help students grasp the latest trends in semiconductor manufacturing and serve as a foundation for advanced process courses offered by the College of Semiconductor Research.

Instruction is primarily in Chinese, with English lecture materials provided.

### 課程亮點

課程時段 114-2學期 星期五 09:00~12:00

- 一門打通製程全流程
- 進階製程課程的最佳銜接核心課
- 深入解析IEDM 與 VLSI Symposium 最新技術
- 先進封裝與 3D IC 技術發展介紹
- 國家級科技研發經驗 × 實際量產

### 教授簡介 >>>>>



Instructor | 沈昌宏 教授 SHEN, Chang-Hong

- 國立清華大學半導體研究學院製程研發部主任
- 專精於單晶片式三維積體電路技術、二維材料電晶體技術、化合物半導體磊晶及元件技術
- 曾任台灣半導體研究中心 (TSRI) 副主任



課程科號

11420

CSR5417

半導體製造之製程監控和品質改善技術

Course Title

# Process monitoring and quality improvement technology in semiconductor manufacturing

## Course Information (Offered in Chinese) >>>>>

This course is ideal for students aiming to work as quality engineers, process integration engineers, or module engineers in the semiconductor industry. It focuses on the analysis of in-line manufacturing data and process improvement strategies based on process capability.

To strengthen practical problem-solving skills, class discussions and assessments emphasize logical and analytical thinking rather than rote memorization.

### 課程亮點

課程時段 114-2學期 星期二 15:30~17:20

- 從 SPC 入門到實戰
- 真實 Fab 案例導向
- 跨模組品質監控全解析
- 強化工程邏輯與問題解決力
- 品管工程 × 模組工程 × 製程整合

### 教授簡介 >>>>>



Instructor | 李宏仁 教授 LEE, Heng-Jen

- 國立清華大學半導體研究學院製程研發部副主任
- 專精於先進黃光製程、光罩技術、Fab 製程監控
- 25+ 年先進節點 ( 0.25  $\mu\text{m}$ -10 nm ) 研發與量產管理



課程科號

11420

CSR5418

# 扇出型晶圓級封裝

Course Title

# Fan-Out Wafer-Level Packaging

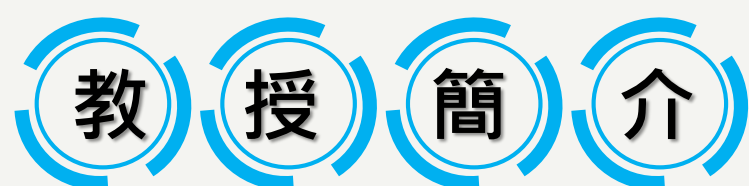
## Course Information (Offered in Chinese) >>>>>

TSMC employed their InFO (integrated fan-out) technology in the application processor for most advanced mobile phone, in 2016, generating great excitement about FOWLP technology throughout the semiconductor packaging community. Essential details of FOWLP – such as the temporary bonding and de-bonding of the carrier on a reconstituted wafer/panel, epoxy molding compound (EMC) dispensing, compression molding, Cu revealing, RDL fabrication, solder ball mounting, etc.– will be addressed.



課程時段 114-2學期 星期三 09:00~12:00

- 從 FOWLP 到 InFO 的完整製程解析
- CoWoS × SoIC × 3DFabric 架構一次掌握
- AI / HPC 封裝實務案例深度剖析
- 製程模組 × 製程整合的系統性思維
- 連結先進封裝研發與量產實務



Instructor | 劉重希 教授 Liu, Chung-Shi

- 國立清華大學半導體研究學院製程研發部專任教授
- 專精 Fan-Out、3DIC、異質整合與光電共同封裝
- 700+ 件美國專利，多項國家級產業創新獎項
- 30+ 年半導體製程與先進封裝關鍵技術研發與管理