



教學計劃表 Syllabus

課程名稱(中文) Course Name in Chinese	太陽能電池		學年/學期 Academic Year/Semester	113/1	
課程名稱(英文) Course Name in English	Photovoltaic Devices				
科目代碼 Course Code	EE_D0110	系級 Department & Year	博士	開課單位 Course-Offering Department	電機工程學系
修別 Type	選修 Elective	學分數/時間 Credit(s)/Hour(s)	3.0/3.0		
授課教師 Instructor	/黃家華				
先修課程 Prerequisite					
課程描述 Course Description					
The irradiance of sun light is briefly discussed. The fundamental concepts and operation principles of photovoltaic devices are introduced. The required properties of semiconductor materials for photovoltaic applications are addressed. The technologies of crystalline photovoltaic devices including Si solar cells, and III-V compound solar cells are presented.					
課程目標 Course Objectives					
本課程主要介紹太陽能電池基本概念和工作原理，及介紹可應用於太陽能電池之主要材料和其特性，並說明各類太陽能電池之元件結構及設計原理					
系專業能力 Basic Learning Outcomes					課程目標與系專業能力相關性 Correlation between Course Objectives and Dept.'s Education Objectives
A	培育具備電機電子資訊工程等專業技術研發之能力。To cultivate the research and developing ability of electrical, electronics and information engineering。				●
B	培育系統分析、模擬驗證、實作實現之能力。To cultivate the advanced ability of analysis, verification and implementation of systems。				○
C	訓練軟體工具使用與硬體實務驗證相互輔助之能力。To train the auxiliary ability between the utilization of software tool and the verification of the hardware practice。				○
D	訓練電機電子資訊專業知識與工程實務相互結合運用之能力。To train the integrate ability between professional EECS knowledge and engineering practice。				●
E	落實高科技研究之分工整合與團體合作之領導能力。To fulfill the leading ability in high-tech research with integration and teamwork cooperation。				○
F	落實發掘問題、邏輯分析、克服瓶頸與持續學習之能力。To fulfill the ability of question finding, logical analyzing, bottleneck overcoming and continuous learning。				●
G	了解學術倫理與智慧財產觀念，掌握國內外產業更迭需求與具備多元專長之能力。To obtain the ability of multi-specialization and to meet the industry demand as well as to have the ability of academic ethics and concept of intellectual property。				○
H	參與國際研討會了解國際市場變化與未來研究走向，具備純熟科技英文閱讀溝通寫作之能力。To participate the conferences to understand the change of global market and the future trend as well as to have the skillful ability of reading, conversation and technical writing in English。				○
圖示說明 Illustration : ● 高度相關 Highly correlated ○ 中度相關 Moderately correlated					
授課進度表 Teaching Schedule & Content					
週次 Week	內容 Subject/Topics				備註 Remarks

1	1. Introduction of course contents 2. Introduction of photovoltaics	
2	Fundamentals of semiconductors: 1. Intrinsic and extrinsic semiconductors 2. Doping 3. Semiconductor statistics	
3	Fundamentals of semiconductors: 4. Degenerate and nondegenerate semiconductors 5. Direct and indirect bandgap semiconductors	
4	Junction theory: 1. Formation of pn junction 2. Band diagram of pn junction 3. Heterojunction	
5	1. Interaction between light and semiconductors 2. Emission and absorption of photons 3. Absorption coefficients and penetration depth 4. Thickness of solar cells	
6	1. Fundamentals of photovoltaics 2. Solar spectrum 3. Standard reporting conditions and measurements 4. IV characteristics 5. Performance of photovoltaic devices	
7	Exam 1	
8	Operation principles of pn-junction photovoltaic devices	
9	Required properties of photovoltaic materials Classification of photovoltaic materials	
10	Development trends and current status of photovoltaics	
11	Classification of solar cells: 1. Wafer-based solar cells 2. Thin-film solar cells	
12	Fundamentals of crystalline Si solar cells	
13	Exam 2	
14	High-efficiency crystalline Si solar cells	
15	1. III-V solar cells 2. Multi-junction solar cells 3. Concentrator photovoltaics	
16	Introduction of thin-film solar cells	
17	Oral presentations	
18	Flexible solar cells	

教學策略 Teaching Strategies

- 課堂講授 Lecture 分組討論 Group Discussion 參觀實習 Field Trip
 其他 Miscellaneous:

教學創新自評 Teaching Self-Evaluation

創新教學 (Innovative Teaching)

- 問題導向學習 (PBL) 團體合作學習 (TBL) 解決導向學習 (SBL)
 翻轉教室 Flipped Classroom 磨課師 Moocs

社會責任 (Social Responsibility)

- 在地實踐 Community Practice 產學合作 Industry-Academia Cooperation

跨域合作 (Transdisciplinary Projects)

- 跨界教學 Transdisciplinary Teaching 跨院系教學 Inter-collegiate Teaching
 業師合授 Courses Co-taught with Industry Practitioners

其它 other:

學期成績計算及多元評量方式 Grading & Assessments

配分項目 Items	配分比例 Percentage	多元評量方式 Assessments							
		測驗 會考	實作 觀察	口頭 發表	專題 研究	創作 展演	卷宗 評量	證照 檢定	其他
平時成績 General Performance									
期中考成績 Midterm Exam	40%	✓							
期末考成績 Final Exam	40%	✓							
作業成績 Homework and/or Assignments									
其他 Miscellaneous (oral presentation and term papers)	20%			✓	✓				

評量方式補充說明

Grading & Assessments Supplemental instructions

教科書與參考書目 (書名、作者、書局、代理商、說明)

Textbook & Other References (Title, Author, Publisher, Agents, Remarks, etc.)

1. "Handbook of Photovoltaic Science and Engineering," John Wiley & Sons.
2. "The Physics of Solar Cells," Jenny Nelson, Imperial College Press.
3. "Photovoltaic Materials," Richard H. Bube, Imperial College Press.

課程教材網址(含線上教學資訊, 教師個人網址請列位於本校內之網址)

Teaching Aids & Teacher's Website(Including online teaching information.

Personal website can be listed here.)

meet.google.com/pue-oprt-kmj

其他補充說明 (Supplemental instructions)