

國立臺灣大學工學院新開課程綱要

一、課程基本資訊

系所	材料系	授課教師	吳欣潔				
課程名稱	(中文) 熱電材料 (英文) THERMOELECTRIC MATERIALS						☐ 中文授課 ☒ 英文授課
課程編號	527 U2200	班次		學分數	3	☐ 必修 ☒ 選修	☐ 全年 ☒ 半年
上課時間	星期五 2.3.4	上課 地點		人數上限	50	適修 年級	大三以上
課程網址							

二、課程大綱內容 (對應 CEIBA 欄位，以中英並列為原則)

課程概述	This course aims to introduce the basic concepts, operation principles, and current research interests in the field of thermoelectricity, with an emphasis on solid-state physics and chemistry.
課程目標	Starting with the history of thermoelectricity, this course is divided into three major parts: (1) understanding the fundamental thermoelectric effects, including the Seebeck, Peltier, and Joule effects; (2) discussing the state-of-art thermoelectric materials; (3) introducing the prospects on the development of thermoelectricity. After completing this course, students should be able to evaluate the conversion efficiency and design the experimental procedures for specific p-type or n-type thermoelectric materials.
關鍵字	Thermoelectric materials and devices, energy materials, solid-state physics

課程要求 (先修科目或 先備能力)	Thermodynamics of Materials, solid-state physics
指定閱讀 (教科書)	D. M. Rowe, 1995, <u>CRC Handbook of Thermoelectrics</u> , CRC Press LLC, FL, United States.
參考書目	G. S. Nolas, J. Sharp and H. J. Goldsmid, 2001, <u>Thermoelectrics, Basic Principles and New Materials Developments</u> , Springer, New York, United States.
課程進度	
週次	單元主題
1	Opening remark
2	Solid state Chemistry section 1: Chemical trends and structures
3	Solid state Chemistry section 1: Chemical trends and structures
4	Oral presentation I and open discussion
5	Electronic properties section I: band modeling
6	Electronic properties section I: band modeling
7	Electronic properties section II: carrier concentration and quality factor analysis for TE
8	Oral presentation I and Midterm
9	TE engineering section 1: Heat engines and cooling systems
10	TE engineering section 2: TE system optimization using effective thermal conductivity, thermal impedance considerations
11	TE engineering section 2: TE system optimization using effective thermal conductivity, thermal

	impedance considerations
12	Oral presentation III and open discussion
13	Thermal conductivity of complex materials: section 1: phonons scattering, speed and heat capacity
14	Thermal conductivity of complex materials: section 2: nanoscale microstructure, alloys and TE measurements
15	Thermal conductivity of complex materials: section 2: nanoscale microstructure, alloys and TE measurements
16	Final Exam