

國立中正大學課程大綱

National Chung Cheng University Syllabus

課號 course code	2365012	全英文授課 EMI	☒ 是 ☐ 否
課程類別 course type	☐ 人文關懷課程 ☐ 競賽專題課程 ☒ 問題導向課程 ☐ 專題導向課程 ☐ 總整課程 ☐ 實作課程 ☐ 實習 ☐ 其他		
課程名稱 (中文) Chinese course name	地下水數值模擬		
課程名稱 (英文) English course name	Groundwater Numerical Simulation		
學年/學期 academic year /semester	115/1	學分 credits	3
學系 (所) department	地球與環境科學系碩士班	必選修 required/selected	☐ 必修 ☒ 選修
上課時間 class hours		上課地點 classroom	
教師 instructor	劉台生 (Liou, Tai-Sheng)	教師 email Instructor's email	seiliou@eq.ccu.edu.tw
助教 teaching assistant		助教 email TA's email	
先修科目或 先備能力 prerequisites	無		
課程概述 course descriptions	Groundwater is an important water resource, accounting for approximately 0.6% of the world's total water volume, whereas surface water accounts for only about 0.02%. Due to pollution from various sources, groundwater contamination has become a global environmental issue. This course discusses groundwater flow and contaminant transport in porous/fractured media. Topics include the hydrogeological characteristics of aquifers, fundamental theories of groundwater flow and contaminant transport, and commonly used numerical methods for groundwater simulation.		
學習目標 learning objectives	Upon completion of this course, students will be able to: 1. Explain the fundamental principles of groundwater hydrology. 2. Understand the mathematical foundations and numerical theories underlying groundwater flow and contaminant transport simulations. 3. Develop hydrogeological conceptual models for groundwater simulation problems. 4. Implement and apply numerical simulators to analyze groundwater flow and contaminant transport problems.		
教科書及參考書 textbooks and references	1. Anderson, M. P., Woessner, W. W., and Hunt, R. J. (2015). Applied Groundwater Modeling: Simulation of Flow and Advective Transport (2nd ed.). Academic Press. 2. Zheng, C., and Bennett, G. D. (2002). Applied Contaminant Transport Modeling (2nd ed.). John Wiley & Sons.		

	3. Domenico, P. A., and Schwartz, F. W. (1998). Physical and Chemical Hydrogeology (2nd ed.). John Wiley & Sons. 4. Bear, J. (1972). Dynamics of Fluids in Porous Media. Elsevier.
教學要點概述	
教材編選 teaching materials	☐ 自製簡報(ppt) ☐ 課程講義 ☐ 自編教科書 ☐ 教學程式 ☐ 自製教學影片 ☐ 其他
教學方法 teaching methods	☒ 講述 ☒ 小組討論 ☒ 學生口頭報告 ☐ 問題導向學習 ☐ 個案研究 ☐ 其他
評量工具 Evaluation tools	☒ 期中考 (20%) ☐ 期末考 ☐ 隨堂測驗 ☐ 隨堂作業 ☐ 課後作業 ☐ 期中報告 ☐ 期末報告 ☒ 專題報告 (50%) ☐ 評量尺規 ☒ 其他: 程式實作 (30%)
教學資源 teaching resources	☐ 課程網站 ☒ 教材電子檔供下載 ☐ 實習網站
教師 相關訊息 instructor's information	
每週課程內容 weekly scheduled contents	
Week 1 Review of groundwater hydrology	
Week 2 Review of vector analysis	
Week 3 Groundwater flow and energy equations	
Week 4 Contaminant transport equations	
Week 5 Construction of the conceptual model	
Week 6 Basics of numerical modeling	
Week 7 Analytical models and numerical methods	
Week 8 Introduction to TOUGH2	
Week 9 Midterm	
Week 10 TOUGH2 Utilities	
Week 11 EOS3 benchmark	
Week 12 EOS9 benchmark	
Week 13 EWASG benchmark	
Week 14 ECO2N benchmark	
Week 15 Numerical simulation exercise	
Week 16 Final project	
Week 17 Discussion of the final project I	
Week 18 Discussion of the final project II	
核心能力	

core competencies

核心能力 Core competency		本課程與核心能力關聯強度 Degrees of related to core competencies				
		1	2	3	4	5
專業能力 Specific competency	1.熟悉臺灣能源結構與氣候調適策略、貢獻所學於極端氣候減災工作。					✓
	2.操作地熱及碳封存之科學調查方法。					✓
	3.掌握淨零轉型關鍵戰略之發展與契機。					✓
	4.具備地震活動監測與防減災專業能力。			✓		
	5.強化實作、分析與整合實驗數據能力。					✓
	6.具備操作儀器原理及操作儀器設備之能力。					✓
共通能力 General Competence	1.增進外語能力及培育國際觀。					✓
	2.建立科學思考、邏輯推理能力及獨立研究能力。					✓
	3.具備文獻資料蒐集及整合能力。					✓

註：關聯強度以五點量表標示，1 表示沒有關聯，5 表示非常有關聯。