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②图玄東華大學

教學計劃表 Syllabus

課程名稱(中文) Course Name in Chinese	應數導論AB			學年/學期 Academic Year/Semester		114/1	
課程名稱(英文) Course Name in English	Introduction to Applied Mathematics						
科目代碼 Course Code	AM6200AB	系級 Department 碩士 & Year		開課單位 Course-Offering Department	應用數學系		
修別 Type	必修 Required	學分數/時 Credit(s)/Hou		3.0/3.0			
授課教師 Instructor	/官彦良						
先修課程 Prerequisite							

課程描述 Course Description

This course offers a foundational introduction to quantum computation and quantum information, centered on the textbook Quantum Computation and Quantum Information by Nielsen and Chuang. Students will learn the core concepts of qubits, quantum gates, and quantum circuits, with a particular focus on understanding and implementing Shor's algorithm. Through a blend of theory and algorithmic insight, the course prepares students to grasp how quantum computing challenges classical computational boundaries.

課程目標 Course Objectives

由任課教師依各別專長區分之主題,設定個別目標。 Topics chosen by the teaching professor

		課程目標與系專業能
		力相關性
	糸專業能力	Correlation between
		Course Objectives
	Basic Learning Outcomes	and Dept.'s
		Education
		Objectives 0
A	具備專業數學知識及邏輯推理能力。Have well-founded expertise in mathematics and be	•
	capable of logical reasoning.	-
В	具備學習其它學科的能力,以期能邁向跨領域研究。Be able to study other fields of	
	science so as to conduct interdisciplinary research in the future	•
С	具備獨立思考與解決問題的能力。 Be capable of independent thinking and have the problem-solving skills.	
	be capable of independent unliking and have the problem-solving skills.	·

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	Introduction and Motivation	
2	Linear Algebra Review (I)	
3	Linear Algebra Review (II)	
4	Qubits and State Spaces (I)	
5	Qubits and State Spaces (II)	
6	Multi-Qubit Systems and Gates	

7	Number Theory Basics (I)					
8	Number Theory Basics (II)					
9	Number Theory Basics (III)					
10	Discrete Fourier Transform (I)					
11	Discrete Fourier Transform (II)					
12	Quantum Fourier Transform (I)					
13	Quantum Fourier Transform (II)					
14	Modular Exponentiation Circuits					
15	Order Finding (I)					
16	Order Finding (II) & Continued Fractions					
17	Shor's Algorithm (I)					
18	Shor's Algorithm(II)					
	教學策略 Teaching Strategies					
✓ 課堂講授 Lecture ✓ 分組討論Group Discussion						
	教學創新自評Teaching Self-Evaluation					
創新教學(Innovative Teaching)					
▼ 問題導向學習(PBL) ■ ■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						
一 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 othe	r:					

學期成績計算及多元評量方式 Grading & Assessments									
配分項目	配分比例 Percentage	多元評量方式 Assessments							
Items		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(含出缺席) General Performance (Attendance Record)									
期中考成績 Midterm Exam									
期末考成績 Final Exam									
作業成績 Homework and/or Assignments	100%		~	>					
其他 Miscellaneous									

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.)

Nielsen & Chuang 《Quantum Computation and Quantum Information》

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)

 $\label{thm:condition} \mbox{Teaching Aids \& Teacher's Website} (\mbox{Including online teaching information.}$

Personal website can be listed here.)

googleclassroom: https://classroom.google.com/c/ODA1MjA5MjU10Dk0?cjc=ip116hqx

其他補充說明(Supplemental instructions)