THE CHINESE UNIVERSITY OF HONG KONG
Print Course Catalog Details

Academic Org: Div of Computer Science & Engg – Subject: Computer Engineering

Course: CENG5280 **Course ID:** 015378 **Eff Date:** 2026-07-01 **Crse Status: Active** **Apprv. Status:** Approved **[**New Course**]**
Quantum Computer Systems 量子計算機系統

This course delves into topics in the design of quantum computer systems. We will begin by developing the mathematical foundations of quantum computation and information, followed by an in-depth exploration of powerful techniques in quantum application and architecture design. Students will gain hands-on experience using quantum computing software tools to write quantum programs. Key topics covered include quantum programming, quantum algorithms, quantum compilation, quantum memory, quantum error mitigation and correction.

Advisory: Students are expected to have taken CSCI2510 or CSCI3120 or equivalent.

本課程深入探討量子電腦系統設計領域的核心議題。我們將首先建立量子運算與量子資訊的數學基礎，進而深入探索量子應用與架構設計中的強大技術手段。學生將透過量子運算軟體工具進行實作操作，掌握編寫量子程式的能力。課程涵蓋的關鍵主題包括量子程式設計、量子演算法、量子編譯、量子儲存、量子錯誤緩解與修正等。

建議：學生應曾修讀CSCI2510或CSCI3120或同等學歷

Grade Descriptor: A

EXCELLENT – exceptionally good performance and far exceeding expectation in all or most of the course learning outcomes; demonstration of superior understanding of the subject matter, the ability to analyze problems and apply extensive knowledge, and skillful use of concepts and materials to derive proper solutions.

有關等級說明的資料，請參閱英文版本。

B

GOOD – good performance in all course learning outcomes and exceeding expectation in some of them; demonstration of good understanding of the subject matter and the ability to use proper concepts and materials to solve most of the problems encountered.

有關等級說明的資料，請參閱英文版本。

C

FAIR – adequate performance and meeting expectation in all course learning outcomes; demonstration of adequate understanding of

the subject matter and the ability to solve simple problems.

有關等級說明的資料，請參閱英文版本。

D

MARGINAL – performance barely meets the expectation in the essential course learning outcomes; demonstration of partial understanding of the subject matter and the ability to solve simple problems.

有關等級說明的資料，請參閱英文版本。

F

FAILURE – performance does not meet the expectation in the essential course learning outcomes; demonstration of serious deficiencies and the need to retake the course.

有關等級說明的資料，請參閱英文版本。

Equivalent Offering:
Units: 3 (Min) / 3 (Max) / 3 (Acad Progress)
Grading Basis: Graded
Repeat for Credit: N
Multiple Enroll: N
Course Attributes: MSc Computer Science
MPhil-PhD Computer Sci & Erg

Topics:

COURSE OUTCOMES

Learning Outcomes:

At the end of the course of studies, students will be able to:
1. Synthesis and optimize the quantum circuit for the resource saving purpose.

2. Compile quantum algorithms to hardware execution.
3. Build their own quantum circuit via the quantum programming platforms and play on simulators.

Course Syllabus:

Week 1: Math Basics of Quantum gates and circuits
Week 2: Introduction to the Quantum Noise
Week 3: Introduction to the Quantum Programming Language
Week 4: Introduction to the Quantum Algorithms
Week 5: Introduction to the Compilation of Quantum Computing
Week 6: Quiz I
Week 7: Advanced Quantum Compilation: Scheduling and Synthesis
Week 8: Special Topic in Quantum Compilation
Week 9: Closed and Open Quantum System Control
Week 10: Introduction to the Quantum Error Correction
Week 11: Quantum Teleportation and InterChip Distributed Quantum Computing
Week 12: Introduction to the Quantum Memory
Week 13: Presentation I

Assessment Type:

Homework or assignment	: 25%
Presentation	: 15%
Project	: 35%
Test or quiz	: 25%

Feedback for Evaluation:

1. Test or quiz and examinations
2. Course evaluation and questionnaire
3. Question-and-answer sessions during class
4. Student consultation during office hours or online

Required Readings:

To be provided by course teacher.

Recommended Readings:

1. Quantum Computing Architecture and Hardware for Engineers, Hiu Yung Wong
2. Quantum computer systems: Research for noisy intermediate-scale quantum computers, Yongshan Ding, Frederic T Chong

OFFERINGS

1. CENG5280 — Acad Organization=CSEGV; Acad Career=RPG

COMPONENTS

LEC : Size=30; Final Exam=N; Contact=3
TUT : Size=30; Final Exam=N; Contact=0

ENROLMENT REQUIREMENTS

1. CENG5280

Enrollment Requirement Group:

For students in MSc Computer Science; or
For students in MPhil-PhD Computer Science & Engineering; or
For students in UG AISTN or CDASN or CENGN or CSCIN

New Enrollment Requirement(s):

Other Requirement = For students in MSc Computer Science; or
For students in MPhil-PhD Computer Science & Engineering; or
For students in UG AISTN or CDASN or CENGN or CSCIN

Additional Information

VTL-Onsite face-to-face hrs 0
VTL-Online synch. hrs 0
VTL-Online asynch. hrs 0