THE CHINESE UNIVERSITY OF HONG KONG
Print Course Catalog Details

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

Course: CSCI5170 **Course ID:** 002622 **Eff Date:** 2022-07-01 **Crse Status: Active** **Apprv. Status:** Approved **[**Course Rev**]**

Theory of Computational Complexity **計算複雜性理論**

This course introduces some of the following topics: deterministic and non-deterministic Turing machine, time and space complexity, NP-completeness, polynomial time hierarchy, probabilistic computation, interactive proofs, complexity of counting, concrete models such as query complexity, communication complexity, formula complexity, branching programs and circuit complexity, quantum computation, complexity-based cryptography, randomness-related topics such as derandomness, pseudorandomness, extractors, random walks, etc.

本科將從如下內容中選擇介紹：確定性和不確定性圖靈機，時間和空間複雜性，NP完全性，多項式時間等級，交互證明，計數複雜性，具體模型如查詢複雜性，通信複雜性，公式复杂性，分支程序，電路複雜性，量子計算，基於複雜性的密碼學，隨機性相關課題如消隨機，僞隨機，抽取器，隨機遊走等。

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 have acquired the ability to
1. understand the typical complexity classes and common techniques for various reductions,
2. prove lower bounds in concrete complexity models.

Course Syllabus:

This course introduces some of the following topics: deterministic and non-deterministic Turing machine, time and space complexity, NP-completeness, polynomial time hierarchy, probabilistic computation, interactive proofs, complexity of counting, concrete models such as query complexity, communication complexity, formula complexity, branching programs and circuit complexity, quantum computation, complexity-based cryptography, randomness-related topics such as derandomness, pseudorandomness, extractors, random walks, etc.

Assessment Type:

Short answer test or exam : 100%

Feedback for Evaluation:

1. Quiz and examinations
2. Course evaluation and questionnaire
3. Reflection of teachers
4. Question-and-answer sessions during class
5. Student consultation during office hours or online

Required Readings:

To be provided by course teacher.

Recommended Readings:

1. Computational Complexity---A Modern Approach, Sanjeev Arora and Boaz Barak, Cambridge University Press, 2009.
2. Computational Complexity: A Conceptual Perspective, Oded Goldreich, Cambridge University Press, 2008.
3. Boolean Function Complexity: Advances and Frontiers, Stasys Jukna, Springer, 2012.

OFFERINGS

1. CSCI5170 Acad Organization=CSEGV; Acad Career=RPG

COMPONENTS

LEC : Size=30; Final Exam=Y; Contact=3

ENROLMENT REQUIREMENTS

1. CSCI5170 **Enrollment Requirement Group:**
   For students in MSc Computer Science; or
   For students in MPhil-PhD Computer Science & Engineering; or
   For students in UG Computer Science; or
   For students in UG Computer Engineering

CAF

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