Academic Org: Dept of Computer Sci & Engg – Subject: Computer Science

Course: CSCI2740　　　　　**Course ID:** 014460　　　　**Eff Date:** 2024-07-01　　　**Crse Status: Active**　　　　**Apprv. Status:** Approved　　　　**[Course Rev]**
Competitive Programming 競賽編程

This course introduces the data structures and algorithms useful in programming competitions and technical interviews. Students will learn efficient implementations of these data structures and algorithms as well as basic problem-solving skills for programming competitions and technical interviews. Topics include but are not limited to advanced data structures, advanced search algorithms, decomposition techniques, combinational games, basic computational geometry, and basic number theory.

本科介紹編程比賽及技術面試中常用的數據結構及演算法。學生將學會這些數據結構及演算法的有效實踐，以及編程比賽及技術面試中之基本解題技巧。主題包括但不限於高級數據結構、高級搜索算法、分解技術、組合遊戲、基本計算幾何和基本數論。

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

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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:

Topics:

COURSE OUTCOMES

Learning Outcomes:

At the end of the course of studies, students will be able to:
1. Implement basic algorithms and data structures useful in competitive programming
2. Further learn advanced algorithms in competitive programming by themselves from online resources

Course Syllabus:

Week 1: Basic C++ for Competitive Programming; Special Stacks and Queues
Week 2: Prefix Sum Arrays; Binary Indexed Trees
Week 3: Sparse Tables
Week 4: Segment Trees

Week 5: Binary Exponentiation
Week 6: Dynamic Programming Techniques
Week 7: Square-Root Decomposition; Mo's Algorithm
Week 8: Advanced Depth-First Search (e.g. Bridges)
Week 9: Tree Decomposition (e.g. Heavy-Light Decomposition)
Week 10: String Algorithms (e.g. KMP)
Week 11: Basic Computational Geometry; Basic Number Theory
Week 12: Combinatorial Games; Advanced Topics
Week 13: Mini-Competition

Assessment Type:

| Examination | : 50% |
| Homework or assignment | : 50% |

Feedback for Evaluation:

1. 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:

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Recommended Readings:

1. Antti Laaksonen, "Guide to Competitive Programming: Learning and Improving Algorithms Through Contests", Springer, 2nd edition, 2020
2. Steven Halim, "Competitive Programming 3", Lulu, 2013
3. https://cp-algorithms.com/
4. https://github.com/sahilbansal17/Get_Better_at_CP_in_2_Months

OFFERINGS

| 1. CSCI2740 | Acad Organization=CSD; Acad Career=UG |

COMPONENTS

LAB : Size=50; Final Exam=N; Contact=1
LEC : Size=50; Final Exam=Y; Contact=3

ENROLMENT REQUIREMENTS

1. CSCI2740   **Enrollment Requirement Group:**
     Prerequisite: CSCI2100 or CSCI2520 or ESTR2102

     New Enrollment Requirement(s):
     Pre-requisite = Change from "CSCI2100" to "CSCI2100 or CSCI2520 or ESTR2102"

Additional Information

eLearning hrs for blended cls   0
VTL-Onsite face-to-face hrs   0
VTL-Online synch. hrs   0
VTL-Online asynch. hrs   0
No. of micro-modules   0
Research components (UG)   0%

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