Advanced Data Structures 高級數據結構

This course introduces advanced techniques for designing data structures with strong theoretical guarantees. Topics to be covered include (i) generic methods such as partial persistence, logarithmic rebuilding, weight balancing, filtering, independent sampling, bit twiddling, tabulating, etc., and (ii) specific structures such as the interval tree, the priority search tree, cuckoo hashing, the van Emde Boas structure, range min structures, locality sensitive hashing, the suffix tree, the count-min sketch, etc.

本科旨在介紹用以設計具有優秀理論保證的數據結構的高級技術。要討論的主題包括 (i) 一系列通用的方法，如partial persistence, logarithmic rebuilding, 權重平衡, 過濾, 獨立採樣, bit twiddling, 打表等，以及 (ii) 一系列具體的結構，如區間樹, 優先搜索樹, cuckoo結構, van Emde Boas結構, 局部敏感哈希, 後綴樹, count-min sketch 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.

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.
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 theory behind the techniques covered;
2. Utilize those techniques to design new data structures for solving other related problems.

Course Syllabus:
This course introduces advanced techniques for designing data structures with strong theoretical guarantees. Topics to be covered include (i) generic methods such as partial persistence, logarithmic rebuilding, weight balancing, filtering, independent sampling, bit twiddling, tabulating, etc., and (ii) specific structures such as the interval tree, the priority search tree, cuckoo hashing, the van Emde Boas structure, range min structures, locality sensitive hashing, the suffix tree, the count-min sketch, etc.

Assessment Type:

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Essay test or exam</td>
<td>75%</td>
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<tr>
<td>Homework or assignment</td>
<td>25%</td>
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</tbody>
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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:
To be provided by course teacher.

Recommended Readings:

OFFERINGS
1. CSCI5610 Acad Organization=CSEGV; Acad Career=RPG

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

ENROLMENT REQUIREMENTS
1. CSCI5610
   Enrollment Requirement Group:
   For students in MSc Computer Science or Mphil - PhD Computer Science & Engineering or UG Computer Science or UG Computer Engineering;
   Pre-requisite: CSCI2100 or ESTR2102

Additional Information
VTLOnline face-to-face hrs 0
VTLOnline synch. hrs 0
VTLOnline asynch. hrs 0

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