COMP 7992/8992: Computational Complexity (Fall 2017)

Time, place: Tuesdays/Thursdays 9:40am–11:05am
Dunn Hall 119

Instructor: Thomas Watson
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Office hours: Tuesdays/Thursdays 12:30pm–1:30pm

Website: http://elearn.memphis.edu/

Description: In this 3-credit course you will learn about the fundamental principles governing the capabilities and limitations of efficient computation. In addition to studying classical topics such as time and space complexity and their relationships with nondeterminism and randomness, the course will explore branches of complexity theory that are motivated by other areas of computer science:

- Foundations of cryptography—motivated by security.
- Computational learning theory—motivated by artificial intelligence.
- Interactive proofs—motivated by verification.
- Inapproximability—motivated by optimization.
- Query complexity—motivated by databases.
- Communication complexity—motivated by distributed computing.
- Circuit complexity—motivated by architecture and parallel computing.

Prerequisite: Any prior course on theory of computing, such as COMP 4601/6601 or COMP 7612, or permission of the instructor

Textbook: Recommended: *Computational Complexity: A Modern Approach* by Sanjeev Arora and Boaz Barak

Grading: There will be five homework assignments. You may discuss homework problems with other students, but you must write up solutions entirely on your own (and in your own words). You must submit each homework as a single file in the corresponding dropbox folder in the elearn website for the course. If you choose to handwrite your homework solutions (rather than using software such as LaTeX), you may turn in a scan or photo (with all problems combined into a single file), as long as it is easy to read. Each homework is due right before the beginning of a lecture, and late homeworks cannot be accepted since model solutions will be distributed in class.

For students taking the course at the 7000-level, each homework assignment

will be worth 20% of the grade. For 8000-level students, each homework will be 18%, and the remaining 10% will be for a short write-up describing what is known at the frontier of a research-level topic related to the course material.

Cheating: Plagiarism or cheating behavior in any form is unethical and detrimental to proper education and will not be tolerated. All work submitted by a student (projects, programming assignments, lab assignments, quizzes, tests, etc.) is expected to be a student's own work. The plagiarism is incurred when any part of anybody else's work is passed as your own (no proper credit is listed to the sources in your own work) so the reader is led to believe it is therefore your own effort. Students are allowed and encouraged to discuss with each other and look up resources in the literature, but appropriate references must be included for the materials consulted, and appropriate citations made when the material is taken verbatim.

If plagiarism or cheating occurs, the student will receive a failing grade on the assignment and (at the instructors discretion) a failing grade in the course. The course instructor may also decide to forward the incident to the Office of Student Conduct for further disciplinary action. For further information on U of M code of student conduct and academic discipline procedures, please refer to: `http://www.memphis.edu/studentconduct/misconduct.htm`

Calendar:

Aug 29: lecture 1
Aug 31: lecture 2
Sep 05: lecture 3
Sep 07: lecture 4, hw 1 assigned
Sep 12: lecture 5
Sep 14: lecture 6
Sep 19: lecture 7
Sep 21: lecture 8
Sep 26: lecture 9, hw 1 due, hw 2 assigned
Sep 28: lecture 10
Oct 03: lecture 11
Oct 05: lecture 12
Oct 10: lecture 13
Oct 12: lecture 14, hw 2 due, hw 3 assigned
Oct 17: fall break—no class
Oct 19: lecture 15
Oct 24: lecture 16
Oct 26: lecture 17
Oct 31: lecture 18
Nov 02: lecture 19, hw 3 due, hw 4 assigned
Nov 07: lecture 20
Nov 09: lecture 21
Nov 14: lecture 22
Nov 16: lecture 23

Nov 21: lecture 24, hw 4 due, hw 5 assigned
Nov 23: Thanksgiving break—no class
Nov 28: lecture 25
Nov 30: lecture 26
Dec 05: lecture 27, hw 5 due, research survey due (8992 students)