CSE 6321 - Computability and complexity

Lectures: MoWeFr 11:30AM–12:25PM, Caldwell Lab 0133
Instructor: Luis Rademacher
Office: DL 495
Email: `lrademac@cse.ohio-state.edu`
Grader: Joseph Anderson (`andejose@cse.ohio-state.edu`)
Web page: Go to `http://www.cse.ohio-state.edu/~lrademac/`, then "Teaching", then "Sp14".

Textbook: Michael Sipser, Introduction to the Theory of Computation, 3rd edition.
Other books: C. Papadimitriou, Complexity Theory. S. Arora and B. Barak, Complexity Theory, a Modern Approach.

Prerequisites

CSE 3321/5321 "Automata and Formal Languages" (625) or equivalent or consent of instructor. Automata theory, mathematical background/maturity (Chapter 0 of Sipser's book: mathematical proof, by contradiction, by induction, sets, relations, functions, cardinality).

Topics (tentative)

Computation, algorithm, models. Definition of Turing machines. Languages. Recognizable, decidable. Variants of TM, equivalences, Church-Turing thesis. Non-determinism. Decidability. Diagonalization method. The halting problem. Universal Turing machine. Reductions. More undecidable problems. Rice's theorem. The recursion theorem.

Complexity measures. Complexity classes. Class P. Class NP. The P vs NP question. More reductions. Polynomial time reductions. NP-hardness.

NP-completeness. Cook-Levin theorem. SAT, 3-SAT. Additional NP-complete problems. vertex-cover, hamiltonian-path, subset-sum, knapsack, coloring, IP.

Space complexity. Savitch's theorem. PSPACE. PSPACE-completeness. Complexity of games. Logarithmic space. L. NL. NL-completeness. PATH is NL-complete. NL=coNL

Grading (tentative)

Problem sets. For homework, collaboration is allowed, but every student must write and submit his or her own solutions, and include an explanation of any such collaboration. Looking for solutions from external sources (books, the web, etc.) is prohibited.

Two midterms and one final exam.

Formula (tentative): 25% homework, 25% each midterm, 25% final exam.