CS4124 Theory of Computation Fall 2014 MWF 9:05–9:55 WMS 320 CRN 82160

Instructor: L. T. Watson, 2000 Torgersen, 231-7540, `ltw@cs.vt.edu`
Office Hours: 11:15–12:30 MW in 122 McBryde, and by appointment in 2000 Torgersen.

Prerequisites: Math 3134 or Math 3034.

Text: J. E. Savage, *Models of Computation*, Addison-Wesley, Reading, MA, 1998; XanEdu, Ann Arbor, Michigan, 2003 (`http://www.modelsofcomputation.org`).

Topics Covered: Logic circuits, Boolean function normal forms, prefix computations, arithmetic, circuit complexity, finite-state machines, random-access machines, Turing machines, simulation, pushdown automata, regular and context-free languages, models of computability, reducibility and unsolvability, recursive function theory, parallel computation, space-time tradeoffs.

Grading: FINAL GRADE will be the average of two in-class exams ($\approx 50\%$), a final examination ($\approx 25\%$), and homework and class participation ($\approx 25\%$). All questions regarding grades must be raised within three days of the date the assignment is returned.

Final Exam: 10:05–12:05, Tuesday, December 16, 2014.

References:

Clark and Cowell, *Programs, Machines, and Computation*, McGraw Hill, 1976.

D. I. A. Cohen, *Introduction to Computer Theory*, 2nd Ed., Wiley, 1997.

Davis, Sigal, and Weyuker, *Computability, Complexity, and Languages*, 2nd Ed., Academic Press, 1994.

Denning, Dennis, Qualitz, *Machines, Languages, and Computation*, Prentice-Hall, 1978.

Gill, *Introduction to the Theory of Finite State Machines*, McGraw-Hill, 1962.

Goddard, *Introducing the Theory of Computation*, Jones and Bartlett, 2008.

Hopcroft, Ullman, *Introduction to Automata Theory, Languages, and Computation*, Addison-Wesley, 1979.

Kain, *Automata Theory, Machines, and Languages*, McGraw-Hill, 1972.

Kfoury, Moll, Arbib, *A Programming Approach to Computability*, Springer-Verlag, 1982.

Manna, *Mathematical Theory of Computation*, McGraw-Hill, 1974.

McNaughton, *Elementary Computability, Formal Languages, and Automata*, Prentice Hall, 1982.

Minsky, *Computation: Finite and Infinite Machines*, Prentice-Hall, 1967.

B. M. Moret, *The Theory of Computation*, Addison-Wesley, 1998.

Rogers, *Theory of Recursive Functions and Effective Computability*, McGraw-Hill, 1967.

R. G. Taylor, *Models and Computation and Formal Languages*, Oxford, 1998.

Homework Assignments

All problems are from the text unless otherwise indicated. Point values are in parentheses or brackets, where brackets indicate extra credit problems.

Due 08/29/14: 1.3(2), 1.5(2), 1.10(4), 1.13(2).

Due 09/05/14: 1.14(2), 1.18(2), 1.19(3), 1.21(3).

Due 09/12/14: 2.3(2), 2.5(2), 2.8(4), 2.9(4).

Due 09/19/14: 2.11(2), 2.12(4), 2.13(4).

Due 10/03/14: 2.17(4), 2.18(4), 2.20(2), 2.26(3).

Due 10/17/14: 3.4(2), 3.7(3), 3.17(3), 3.20(2).

Due 10/31/14: 3.23(5), 3.30(5), 3.34(5).

Due 11/07/14: 4.5(2), 4.9(2), 4.17(2), 4.18[10].

Due 11/14/14: 4.22(3), 4.24(3), 4.25(5), 4.32(2), 4.47[10].

Due 12/08/14: 5.12[10], 5.13[10], 5.17(10), 5.18[5], 5.24(5), 5.25[10].