

**Instructor:** L. T. Watson, 2000 Torgersen, 231-7540, [ltw@cs.vt.edu](mailto:ltw@cs.vt.edu)

**Office Hours:** 10:00–11:00 MWF 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, Friday, December 11, 2009.

#### 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 08/28/09:** 1.3(2), 1.5(2), 1.10(4), 1.13(2).

**Due 09/04/09:** 1.14(2), 1.18(2), 1.19(3), 1.21(3).

**Due 09/11/09:** 2.3(2), 2.5(2), 2.8(4), 2.9(4).

**Due 09/18/09:** 2.11(2), 2.12(4), 2.13(4).

**Due 10/02/09:** 2.17(4), 2.18(4), 2.20(2), 2.26(3).

**Due 10/16/09:** 3.4(2), 3.7(3), 3.17(3), 3.20(2).

**Due 10/30/09:** 3.23(5), 3.30(5), 3.34(5).

**Due 11/06/09:** 4.5(2), 4.9(2), 4.17(2), 4.18[10].

**Due 11/13/09:** 4.22(3), 4.24(3), 4.25(5), 4.32(2), 4.47[10].

**Due 12/07/09:** 5.12[10], 5.13[10], 5.17(10), 5.18[5], 5.24(5), 5.25[10].