

Special Topics: Automated Theorem Proving

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Dr. Donald Simon

Office / Phone: 416 College Hall / 396-6472

E-mail: simon@mathcs.duq.edu

Home page: <http://www.mathcs.duq.edu/profs/simon.html>

Office Hours: MWTh 4:30-5:30

Text: *Logic in Computer Science: Modelling and reasoning about systems* by Michael R. A. Huth and Mark D. Ryan

There is a web page associated with the book at <http://www.cis.ksu.edu/~huth/lics> and also at www.cs.bham.ac.uk/research/lics.

Course Objectives: We will discuss modern techniques in automated theorem proving. Theorem provers can be used as mathematical assistants, to verify programs, and to check hardware specifications. We will begin with the necessary background in logic, namely proposition and predicate calculus. We will discuss natural deduction systems as well as resolution. Other topics will include: model checking, binary decision diagrams, modal and higher-order logics, and Bayesian decision networks. The course will emphasize the use of computer tools for proving theorems and verification.

Grading: (COSM 493 and MATH 493)

Assignments 75%

Final 25%

Grading: (CPMA 593)

Assignments 60%

Project 15%

Final 25%

The grading scale is:

100-90 = A, 89-80 = B, 79-70 = C, 69-60 = D, below 60 = F.

Plus/minus grading will **not** be used.

There will be six homework and/or computer assignments and a final. For CPMA 563, there will also be a project.

Honor Policy: See the College of Liberal Arts policy for scholastic dishonesty. Any student guilty of plagiarism will at least receive a grade of "F" for the course. Work done in this course is to be by the individual, not a group. You may not share (copy, give, show) your homework with other students in the

course.

Late Work: Late assignments will not be accepted for credit.

Tentative Schedule:

	Date	Topic(s)	Readings
1.	6/16	Introduction	H & R, pp. 1-45; Little Engines of Proof
2.	6/18	Propositional Logic	H & R, pp. 45-89, notes
3.	6/19	Predicate Logic	H & R, pp. 90-128, notes
4.	6/23	Semantics	H & R, pp. 128-147
5.	6/25	Resolution & Otter	Otter home page , notes , example , Otter manual
6.	6/30	Model Checking	H & R, pp. 148-181
7.	7/2	SMV	H & R, 181-215, SMV manual
8.	7/3	Program Verification	H & R, pp. 216-260 =
9.	7/7	Lisp, NQTHM, and ACL2	ACL2 Version 2.7 , notes
10.	7/9	Modal Logics	H & R, pp. 261-314
11.	7/14	Binary Decision Diagrams	H & R, pp. 316-374
12.	7/16	Prolog & Bayesian Decision Networks	Prolog manual , GNU Prolog manual , Computing Surveys article
13.	7/17	Higher-Order Logics	
14.	7/21	LCF and ML	
15.	7/23	Final	Proof rules

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[Dr. Donald L. Simon, *simon@mathcs.duq.edu*](mailto:simon@mathcs.duq.edu)