Math 232
syllabus
Spring 2013

Professor:	Matthew Neal (`nealm@denison.edu`)
Office and phone:	Olin 202 (6288)
Office Hours:	MTWRF 1:30-3:30 or by appointment
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Course

This course is an introduction to many of the the mathematical methods most typically used in modeling and analyzing real world problems. The focus of the course is on analyzing word problems and communicating conclusions. To do this, you will apply many concepts from Math 124 and Math 231. Mathematica will be used extensively.

Book

Mathematical Modeling by Mark Meerschaert

Grades and Expectations

The grade will be calculated based on homework, quizzes, and 2 final problems

- 30 % for homework problems done jointly with a partner
- 35 % for homework completed individually
- 15 % for weekly quizzes
- 20 % for final problems

Every week I will assign a group of problems to be completed with a partner. Your partner will change each week. I will also assign homework to be completed alone which is based of material from the previous week. You will also have a quiz each Friday consisting of 1 short answer question concerning the pure mathematical justification of some technique we have learned. Lastly, there will be two take home "final" problems due on Monday of Finals week.

Topics and Schedule

We will cover most problems in the book and periodically add some fun math topics from outside the book. Broadly, we will study optimization models, dynamic models, and probabilistic/statistical models. Each of these topics will feature both analytic methods and simulation. The specific topics and chronology is as follows:

Week 1: One variable optimization: five step method, sensitivity analysis, model robustness

Week 2: Multivariable optimization: Unconstrained optimization, Lagrange multipliers, sensitivity analysis, shadow prices

Week 3: Computational methods for optimization: single and multivariable methods, Newton's method

Week 4: Linear programming, discrete optimization, software implementation

Week 5: Dynamic models: steady state analysis, dynamical systems, discrete time dynamical systems

Week 6: Dynamic models: eigenvalue methods

Week 7: Simulation of dynamic models: simulation, continuous-time models

Week 8: Simulation of dynamic models: Euler method, chaos, fractals

Week 9: Probability models: discrete models, continuous models

Week 10: Probability models: statistics, diffusion, Fourier transform

Week 11: Stochastic models: Markov chains, Markov processes

Week 12: Stochastic models: linear regression, time series

Week 13: Simulation of probability models: Monti Carlo simulation, simulation with the Markov property

Week 14: Simulation of probability models: analytic simulation

Office Hours

Every afternoon from 1:30 to 3:30 I will be in my office for help with Math or other issues. Please come to office hours so I can get to know you better!

Late Work

Late assignments will receive a 20 % point penalty per day late unless there is a PRIOR written note (such as a note from Whistler) that verifies a VERY strong excuse (such as illness or important sports team events). Late quizzes are not accepted at all without a written excuse as above.

Academic Integrity

The students and faculty of Denison University and the Department of Mathematics and Computer Science are committed to academic integrity and will not tolerate any violation of this principle. Academic honesty, the cornerstone of teaching and learning, lays the foundation for lifelong integrity.

Academic dishonesty is, in most cases, intellectual theft. It includes, but is not limited to, providing or receiving assistance in a manner not authorized by the instructor in the creation of work to be submitted for evaluation. This standard applies to all work ranging from daily homework assignments to major exams. Students must clearly cite any sources consulted, not only for quoted phrases but also for ideas and information that are not common knowledge. Neither ignorance nor carelessness is an acceptable defense in cases of plagiarism. It is the students responsibility to follow the appropriate format for citations.

Proposed and developed by Denison students, passed unanimously by DCGA and Denisons faculty, the Code of Academic Integrity requires that instructors notify the Associate Provost of cases of academic dishonesty, and it requires that cases be heard by the Academic Integrity Board. Further, the code makes students responsible for promoting a culture of integrity on campus and acting in instances in which integrity is violated.

For further information about the Code of Academic Integrity see http://www.denison.edu/about/integrity.html

Disabilities

Any student who feels he or she may need an accommodation based on the impact of a disability should contact me privately as soon as possible to discuss his or her specific needs. I rely on the Academic Support and Enrichment Center in 102 Doane to verify the need for reasonable accommodations based on documentation on file in that office.