

MATHEMATICAL MODELING: MATH 330
TR 12:30pm – 1:45pm in HT 215
Spring 2009 Syllabus and Schedule

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Course: Mathematical Modeling is the capstone course for the mathematics major at Monmouth College. We will use a combination of modeling and your previous coursework from calculus, linear algebra, and programming to study applications taken from ecology, warfare, physics, business, chemistry, and politics.

Textbook: Mathematical Modeling, 3rd Edition by Mark Meerschaert, Academic Press 2007.

Office Hours: MTWRF 11:00 am – 12:00 pm. Office hours are a valuable resource and I hope you take advantage of them early and often. If you need to see me at a time other than an office hour, feel free to “drop in” or make an appointment.

Grading: The grades for this course will be determined as follows:

Assigned Problems (20%) One learns mathematics by doing mathematics. Thus, these homework assignments are an essential aspect of the course, requiring an investment of careful thought. Solutions to the assigned problems should be written up clearly, and should contain explanation of all critical steps.

Reports and Presentations (30%) – There will be a few small projects that you will complete for this course, either individually or within small groups. You will convey your results through presentations or written reports. The goal of these projects is to directly connect you to the modeling process.

Midterm Exam (20%) There will be one midterm exam, tentatively scheduled as a take-home around the middle of the semester.

Final Project (20%) In place of a final exam, you will complete a final project and presentation. The final project will be due in draft form, and handed back for revisions before your final presentation held from 6pm - 9pm on Friday, May 8.

Attendance & Class Participation (10%) Your presence and contribution to discussions, with questions or comments, are an essential aspect of how this course runs. Students are expected to attend all classes.

Mathematics Department Grading Scale:

100 ← A → 94 ← A- → 91 ← B+ → 88 ← B → 82 ← B- → 79 ← C+ → 76

76 ← C → 70 ← C- → 67 ← D+ → 64 ← D → 58 ← D- → 55 ← F → 0

Technology: In this class, we will run into many problems where hand calculations are not desirable or even possible. In these cases, we will use appropriate technology where necessary. Programs such as *Berkeley-Madonna*, *LINDO*, and *Mathematica* have many capabilities, such as performing basic operations of calculus and linear algebra, and are particularly well-suited for visualization and graphics. You are encouraged to use technology to help you in learning the material, as well as to solve and check the problems of the course.

Note: The Academic Dishonesty Policy as explained in Scots Guide will be strictly enforced. Plagiarism could result in the failure of the course and possible suspension from the college.

Math 330-01 Tentative Schedule

Tuesday	Thursday
1/13 Winter Break No Classes	1/15 Course Introduction Fill the Room With Ping Pong Balls
1/20 The Modeling Process Optimization	1/22 Optimization Sensitivity
1/27 Optimization Robustness	1/29 Modeling with Data
2/3 Modeling with Data Least Squares	2/5 Presentations on Optimization
2/10 Linear Programming Graphical Method	2/12 Linear Programming LINDO
2/17 Linear Programming LINDO	2/19 Dimensional Analysis
2/24 Dimensional Analysis Atomic Explosion of 1945	2/26 Presentations on Linear Programming
3/3 Exponential Growth Berkeley-Madonna	3/5 One-Dimensional Dynamic Models Harvesting & Competition
Spring Break	Spring Break
3/17 One-Dimensional Dynamic Models Stability & Chaos	3/19 One-Dimensional Dynamic Models Prescribing Drugs & Paying Bills
3/24 Discrete Dynamic Models Leslie Matrices	3/26 Discrete Dynamic Models Epidemics
3/31 Discrete Dynamic Models Epidemics	4/2 Continuous Dynamic Models Competition
4/7 Continuous Dynamic Models Competition	4/9 Continuous Dynamic Models Predator-Prey
4/14 Continuous Dynamic Models Predator-Prey	4/16 Continuous Dynamic Models Combat
4/21 No Classes Founders Day	4/23 Continuous Dynamic Models Combat
4/28 Weighted Elections	4/30 The Electoral College
5/5 Family Planning	5/7 Reading Day No Classes

Final Presentations: Friday, May 8 from 6pm – 9pm