Math 4583, Introduction to Modeling

Course Information Fall 2015

Professor: Dr. Lisa Mantini, 410 Math Sciences
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- ▷ Course Times: MWF 2:30–3:20 PM in 514 MSCS.
- ▷ Instructor's office hours: TR 2:30–3:30 PM and by appointment.

Prerequisites: Calculus I and II (Math 2144 and 2153) and Linear Algebra (Math 3013) are the prerequisites listed in the catalog. The course this fall will also require students to use techniques from Differential Equations (Math 2233) in the last third of the course. Students who are concurrently enrolled in Math 2233 should be fine. Students may be asked to use techniques from statistics, to use an Excel spreadsheet, or to do other computer programming at times.

Course Objectives: The aim of this course is for students to experience the various aspects of modeling real-world phenomena with mathematical methods, such as

- constructing a mathematical model from real-world data, using simplifying assumptions as needed;
- analyzing mathematical models to derive conclusions about the resulting mathematical behavior;
- comparing the mathematical conclusions drawn to the behavior of the real-world phenomena to predict behavior and refine the model.

Text: *A First Course in Mathematical Modeling*, fifth edition, by Giordano, Fox, and Horton.

Course Requirements: Students enrolled in this course will complete the following:

ITEM	DATE	POINTS	WEIGHT
Homework	various	150 pts	20%
Class work, quizzes	various	75 pts	10%
Projects	various	225 pts	30%
Exam 1	Wednesday 23 September	90 pts	12%
Exam 2	Monday 2 November	90 pts	12%
Final Exam	Monday 7 December	120 pts	16%
TOTAL		750 pts	100%

Grading: Preliminary grade cutoffs, which may be curved very slightly if circumstances warrant, are:

- 672 points (89.6%) guarantees an A in the course;
- 597 points (79.6%) guarantees a B;
- 522 points (69.6%) guarantees a C;

- 447 points (59.6%) guarantees a D.

Course Policies: The following policies will be followed in this course.

HOMEWORK In this course you will complete approximately ten homework assignments that cover computational and theoretical aspects of mathematical modeling. Please prepare all written work neatly on 8.5 by 11 inch sheets which are stapled and have no ragged edges. I am not obligated to grade work which is sloppy, illegible, or does not conform to these guidelines.

PROJECTS There will be three projects in this course, worth 50, 75, and 100 points. These will be typed up neatly using a mathematical typesetting system such as the equation editor in MS Word or using LaTeX.

GROUP WORK Some of the assignments and projects will be group projects which may require meeting times outside of class. Group members will also evaluate each other's contribution to the project. Group members are not guaranteed to each earn the same grade on the project. Students will fill out an information sheet indicating their group member preferences on the first class day, to facilitate assignment of groups.

SEATING CHART To facilitate having groups work with each other on in-class activities, we will have a seating chart which will keep group members sitting at the same table. This chart will be available during the first week of class.

D2L I will post course information, assignments, exam review problems, and homework solutions on our D2L page.

EMAIL COMMUNICATION I will use the Class List in D2L to email students with news about the course, schedule changes, or other items. Group members may also contact each other using the link on the Class list in D2L. Please set your email address in D2L to one you check *daily*.

ATTENDANCE POLICY Attendance is required. Three absences are allowed without penalty. Absences beyond three will each cause a deduction of **5% from your final grade average**.

MAKEUP EXAMS Makeup exams will be given only for serious and unavoidable conflicts. You must notify me before or as soon as possible after a missed exam. Makeup quizzes are not guaranteed without a penalty.

WITHDRAWAL The last day to drop the course with no fees encumbered and no grade is Monday, August 24. The last day to drop with a partial refund is Friday, August 28. The last day to drop with an automatic grade of W is Friday, November 6. The last day to withdraw from all classes with a grade of W or F is Friday, November 20.

Special Accommodations: If you have a qualified disability and need special accommodations, you should notify me as soon as possible and request verification of eligibility for accommodations from the Office of Student Disability Services.

Report Format: You should submit one report per group, typed with large margins in a word processing system that handles equations well such as LaTeX(preferred) or Microsoft Word with the equation editor. There is no strict page guideline or limit, but reports should be clear and include necessary information without being too wordy. Generally, technical reports are written in the active voice, using the third-person pronoun ("...we will show that...") rather than the passive voice ("...it is shown that..."). Write your report to be a complete, stand-alone document, as if you were submitting it to an employer in answer to a question they had posed, that contains enough detail to satisfy your employer's technical expert who can read the math, but is also nicely presented and clearly worded enough that your employer could send it on to a client without revision.

- Start your report with an Introduction that states the problem you are trying to address, with background information or motivation as needed, and summarizes your approach. You will be repeating information on the project handout, rather than assuming that your reader has a copy of the project handout immediately available.
- Include the definitions of any technical terms and explanations for variables and constants needed as you set up and develop your model. You should also include a discussion of any underlying or simplifying assumptions that are needed in your model.
- The body of your report should include your solution to the problems posed. When a particular computation is so long that the details would interrupt the flow of the argument, you may relegate details to an appendix, otherwise the body of the report should include full mathematical details as needed for a reader who has a suitable mathematical background (i.e., a background like yours). It should be well-organized and should be divided into sections, as needed, to clarify the presentation, and it should include graphs, tables, and figures as needed to illuminate your ideas and make your discussion easier to follow.
- End your report with a section summarizing your conclusions. Feel free to include comments on any limitations in your model or your solution that have become apparent. You may include directions for further research, should your employer wish to authorize this.
- Include references to books and other sources consulted, including our textbook and any web pages consulted.
- Appendices containing longer, technical calculations may be included as needed, but these are optional.

Rubric for project grading: Your projects will be graded as an integrated whole by considering how well it meets the guidelines stated above. I will use the following rubric.

95% This report stands alone as a correct solution to the problem including the elements contained in a 90% paper. More than that, however, it includes significant or unexpected extras, such as particularly good motivational or explanatory comments, creative approaches to helping the reader understand the solution, extra

work beyond the minimum to generalize the results or give further analysis, and so on.

90% This is the minimal report that can stand alone, with a full and correct statement of the problem and its solution. It contains the minimal work necessary to describe the correct solution, including diagrams needed to explain the solution, with only a few minor errors or typos. It likely contains nothing beyond the minimum for correctness and completeness.

85% This report contains some omissions or errors but is mostly correct.

80% This is the minimal report containing a solution which is correct mathematically. It likely lacks clarity in some explanations, fails to include necessary items like full definitions of all terms and variables used.

75% This report is complete in terms of answers to all major questions being included but has significant errors in the derivation.

70%

65% This report likely contains significant errors and also is potentially incomplete, with significant information that is missing.