MAP 4103, Mathematical Modeling, I
MWF 11:30-12:20, Spring, 2009
Dr. Xin Li

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Course Description

This course teaches how to use mathematics. It also has a strong component of computation by emphasizing issues and practical problems in computational mathematics. Students are trained in (1) the procedures and strategies on how to transform a real world problem into a mathematical one, (2) how to analyze the problem numerically and analytically, and (3) how to find a solution numerically and analytically. The course will also be a platform for students to see various applications of mathematics in image analysis, bio-imaging, bioinformatics, finance, and telecommunication.

Course Requirements:

Students should have completed the Calculus sequence, either ordinary differential equations or linear and matrix algebra. Some basic skills in either C programming language or Matlab are welcome but it is hoped that the course's computational component will enhance students' computing skills.

Course Objectives:

Students will be able to apply the principle of mathematical modeling to transform a real world problem into a mathematical one, to use mathematics to analyze the problem, and to solve the problem analytically or numerically.

Required Texts

- Textbook: TBA
- We will supplement the textbook with lecture notes.

Evaluation Procedures

Grade Categories	Description of the requirements	Weight toward final grade
Classroom participation	Pose questions, present homework problems	20%
Homework and Projects	Weekly homework, two projects	30%
Mid-term Exam	50 min in class test	20%
Final Exam	120 min in class test	30%

- Grading scale: A: 90-100, B: 80-89, C: 70-79, D: 60-69, F: <60

Additional Policies

Homework and projects	Students are encouraged to discuss homework and projects problems but the final write-up must be done individually.
Graded assignments	Selected homework and projects will be collected and graded.
Late, make-up and extra credit work	No late homework will be graded. Make-up tests are given if necessary. No extra credit work will be given.

Topics to be covered:

1. Principle of Mathematical Modeling
2. Matlab Basics
3. Matrices and Digital Images
4. Modeling a Camera
5. Detecting Lines
   Least Squares methods
6. Curve Fitting
   Piecewise linear
   Polynomial interpolations
7. Linear Regression
   Stock market and mathematical finance
8. Population Models
   Computational biology
9. Bacteria Models
   Difference equations
10. Eigenfaces
    PCA methods
11. Some physical models
    Newton's equations