Math 530. Mathematics for Scientists and Engineers  
Fall 2013  
Course Website: www.math.colostate.edu/~shipman/math530

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The Goals of the course are to

- gain a working knowledge of the basic mathematical tools in linear algebra, ordinary differential equations, and partial differential equations,
- experience how problems involving linear algebra, and ordinary and partial differential equations arise from problems in engineering and the sciences, and
- use a computer package such as MATLAB to aid in analysis.

We will cover a lot of material in Math 530, so you should plan for it to be an intensive course.

Prerequisites: Math 340 (an introductory course in ODEs with some linear algebra).


Other texts and articles to complement the above will be made available through the course website or handed out in class.

MATLAB will be used on some exercises and is available in the Weber 205 computer lab.

Course Outline:

Linear Algebra: Chapter 3 of the Text.


Ordinary Differential Equations and Boundary Value Problems: Chapters 4-5, 9, and 10 of the Text. Much of Chapter 4 is review from Math 340 (an introductory course in ordinary differential equations); we will some of review this material, but this is expected prerequisite material.

Outline of Topics: Review of linear systems with constant coefficients. Boundary value problems, Fourier Series, Green’s Functions for Boundary Value Problems, Sturm-Liouville Eigenvalue Problems. If there is time, we may cover some numerical technique(s) and/or nonlinear equations from chemical reactions.

Partial Differential Equations: Chapters 1, 6, 7, 9. We may also cover Chapter 8.

Outline of Topics: Overview of linear and nonlinear PDEs, Derivations of the diffusion and wave equations, Separation of variables, Generalized functions and Green’s functions.
Class Structure: I will lecture, but I hope to encourage you often to read relevant material before hand so that class time can be spent in active discussion. Some class time will also be spent discussing problems and readings. If there is a topic or problem that you are particularly interested in, please let me know. We may occasionally meet in Weber 205 to work on MATLAB projects.

Feedback is appreciated. I want you to help determine the balance between mathematics and applications, the use of class time for lectures or discussions, and the amount of class time spent in the computer lab.

Grades will be based on Homework (25%), Quizzes (50%), and a Final Exam (25%).

Homework will consist of (approximately weekly) problem sets (sometimes involving MATLAB), small projects, and reports. Occasionally I may ask you to look up an application that you are interested in and write a report using mathematics that we are learning.

Quizzes will occur approximately weekly.

The Final Exam will be cumulative and may contain a take-home project component.