MATH 526 – Numerical Linear Algebra

Instructor Professor Doug Meade
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Course Website http://www.math.sc.edu/~meade/math526/

Meeting Times Lecture: MWF 10:10AM–11:00AM, LC 303A
Lab: §001 T 9:30AM–10:20AM, LC 303A
§002 T 11:00AM–11:50AM, LC 303A

Text Herman and Pepe, *Visual Linear Algebra*, John Wiley & Sons, Inc., 2005.

Prerequisite Completion of Math 241 with a grade of C or better.

Course Content Linear algebra is the area of mathematics that looks at properties of systems of linear equations. In many realistic cases, these systems contain thousands, if not millions, of equations and unknowns. It is customary to formulate these problems in terms of matrices and vectors. This course is an introduction to the subject of linear algebra with attention given to numerical computations.

A linear system of equations in two dimensions corresponds to a collection of lines; in three dimensions to a collection of planes. Visualization in higher dimensions is not possible, but the same structure and general methods of analysis apply. In this course we will draw upon 2- and 3-dimensional visualizations to develop insights that are valid in higher dimensions.

A fundamental question in linear algebra is finding solutions to a linear system: knowing when a solution exists, how many solutions there are, and finding all solutions in a systematic manner. A second fundamental question is the eigenvalue problem: find all non-zero vectors, $\mathbf{x}$, with the property that $A\mathbf{x} = \lambda\mathbf{x}$ for some constant λ. We will discuss both the computation of λ and $\mathbf{x}$ and the significance and application of eigenvalues.

Some of the specific topics that will be covered while we learn about these two problem include:

Systems of Linear Equations	Vector Spaces
Vectors	Determinants
Matrix Algebra	Eigenvalues and Eigenvectors
Linear Transformations	Orthogonality

Tutorials This CD that comes with the textbook contains a collection of Maple worksheets (and Mathematica notebooks) that correspond to many of the sections of the text and to many of the exercises. We will be making extensive use of these materials. *N*o prior knowledge of Maple is assumed. Instructions for using these materials will be provided during the lab sessions. If you experience any difficulties accessing or using these materials, please let one of us know as soon as possible.

Study Hints You are strongly encouraged to look at each section **b**efore it is discussed in class. Identify the terminology and concepts that will be encountered. Review the skills and techniques that will be used. Formulate questions about details appear particularly important or confusing.

Grading Your grade in this course will be based on your performance on homework, (weekly) labs, three (3) mid-term exams, and a final exam. The weights assigned to each of these components will be:

Homework	15%(drop 3 lowest scores)
Labs	15%(drop 2 lowest scores)
Mid-term exams (2)	45%
Final exam	25%

Course grades will be determined according to the following scale:

A	90 –100
B	80 – 89
C	70 – 79
D	60 – 69
F	0 – 59

The deadline to drop this course with a grade of W is Monday, February 26, 2007.

Exams *Tentative* dates for the mid-term exams are February 5 (Chapters 1 and 2), March 5 (thru §5.3), and April 9 (thru §7.5).
Make-up exams will be given only for documented reasons of illness, family emergency or participation in a University sponsored event. Excuses such as oversleeping, forgetting the time or location of the exam, and lack of studying are explicitly noted as unacceptable grounds for a make-up exam.
A comprehensive final will be given at 2:00P.M. on Wednesday, May 2, 2007.

Homework Problems will be assigned for each chapter. You are expected to work all of these problems and turn in your solutions at the beginning of class on Fridays (generally). Some assignments might be accepted electronically. Details about this will be given at an appropriate time.

Labs The labs for this course will be used to explore several applications of the linear algebra that we are learning. These applications are contained in the textbook. We will be utilizing the tutorial worksheets for these sections as the foundation for these meetings. Some applications will be split over two weeks. You will have assigned problems, from the text, for each application.

Graduate Credit Graduate students enrolled in this course will be expected to work additional problems assigned throughout the semester. Students taking the course for undergraduate credit can work these problems for extra credit.

Attendance Attendance at every class meeting is important – and expected. Students missing more than 10% of the class meetings (4 days) can have their grade lowered.

Academic Honesty Cheating and plagiarism will not be tolerated. You may discuss homework problems with others, but do not copy work from another student or from a book. Violations of this policy will be dealt with according to University guidelines.