Math 2270 (Linear Algebra) Syllabus

**Overview:** Mathematics 2270 is the first semester course of a year-long sequence (2270-2280) devoted to linear mathematics. It is a course in linear algebra, while Math 2280 is an introduction to differential equations. Most students taking the course are Math majors or minors, and will take the whole sequence. Strong engineering and science majors are also encouraged to take 2270-2280 as a more complete alternative to the engineering math courses 2250 and 3150.

Students are expected to learn the theoretical framework of linear algebra as well as the practical computational methods which result from the theory. In particular, they should be required to learn the key definitions, and proofs of the simpler theorems. For example, they should be able to give definitions of vector space, basis, linear independence, linear transformation, etc…Of course, one should give students some indication of the definitions and theorems they are responsible for before testing them.

**Prerequisites:** First year calculus, Math 1210-1220 or 1250-1260 or 1270-1280. Although not a prerequisite, 2270 students would benefit from having taken multivariable calculus, 2210. This would provide motivation for the implications of the spectral theorem for multivariable max-min theory based on the Hessian, as well as connecting the multivariable derivative as a linear map.

**Text:** Linear Algebra and it's Applications, 5th edition, by David C. Lay. ISBN=032198238X.

**Course Outline:** The course covers chapters 1 through 7 of the text. Most sections are “core” sections and need to be covered. Some are optional and can be covered as time permits and at the instructors discretion. The optional sections are 1.10, 2.6-7, 4.9-10, 5.6-8, 6.6-8, and 7.5. All other sections should be considered required. This covers the standard material of a sophomore level linear algebra course: systems of linear equations; the geometry and algebra of vectors in Euclidean n-space; matrix algebra;
determinants; the theory of vector spaces and linear transformations; eigenvalues and eigenvectors; orthogonality; diagonalization of symmetric matrices and quadratic forms.

There are 15 weeks of class, meeting 4 hours a week, so there should be about 55 hours of lecture time (minus a couple of holidays and midterms. There are 40 core sections of the text, and 11 optional ones. It is recommended to give weekly, or near weekly homework (to be collected and partially graded), at least a couple of midterm exams, and a comprehensive final exam. It is also encouraged to have the students do a couple of projects using Maple or Mathlab, although it should not be assumed that students have had experience with either of these. You could schedule a couple of your classes in the computer lab, LCB 115.