MATH 3500–3510 SYLLABUS
Spring 2006

Suggested Text: T. Shifrin, *Multivariable Mathematics: Linear Algebra, Multivariable Calculus, and Manifolds*, J. Wiley & Sons, 2005.

Suggested Course Plan:

(Three hour exams and a cumulative final exam each semester.)

Topic	Sections	Days
Vectors, dot product	1.1–1.2	3
Subspaces	1.3	1.5
Linear transformations and matrices	1.4	3
Determinants and cross product	1.5	1.5
Scalar- and vector-valued functions	2.1	1.5
A bit of topology in $\mathbb{R}^n$	2.2	2.5
Limits and continuity	2.3	3
Partial and directional derivatives and differentiability	3.1–3.2	3
Differentiation rules and gradient	3.3–3.4	2
Curves and applications, higher order derivatives	3.5–3.6	2
Gaussian elimination and linear systems	4.1	2.5
Elementary matrices and inverses	4.2	1.5
Linear independence, basis, dimension	4.3	1.5
Four fundamental subspaces	4.4	2
Introduction to manifolds	4.5	1
Compactness and maximum value theorem	5.1	2
Maximum-minimum problems	5.2	1.5
Lagrange multipliers	5.4	1.5
Quadratic forms and second derivative test	5.3	2
Projections and least squares	5.5	2
Multiple integrals, iterated integrals, Fubini	7.1–7.2	5
Polar, cylindrical, spherical coordinates	7.3	2
Physical applications	7.4	2
Determinants and n-dimensional volume	7.5	2.5
Change of variables theorem	7.6	2.5
Contraction mapping	6.1	1
Inverse and implicit function theorems	6.2	2
Manifolds revisited	6.3	1
Differential forms	8.2	3.5
Line integrals and Green's Theorem	8.3	4
Surface integrals and flux	8.4	2
Stokes's Theorem	8.5	3
Applications to physics and topology	8.6–8.7	3
Linear maps, change of basis, eigenvalues, eigenvectors, and diagonalizability	9.1–9.2	3
Difference equations and differential equations	9.3	2
Spectral Theorem	9.4	2