SYLLABUS FOR **MATH 2500**

Text: Edwards and Penney, *Calculus*, Early Transcendentals Version, Sixth Edition, 2003

Editorial Remarks: Mathematics majors (almost all of whom take MATH 4150 or MATH 4250) need to understand Green's Theorem. In addition, the physics and engineering faculty expect their students to have seen divergence, curl, the Divergence Theorem, and Stokes' Theorem. Although we can't do the final material justice, we should be sure to cover it at least lightly.

I. Vector geometry and algebra

11.1 Vectors in $\mathbb{R}^2$ (1 day)
11.2 Vectors in $\mathbb{R}^3$, dot product, projection (2 days)
11.3 Cross Product (1 day)
11.4 Equations of Lines and Planes (2 days)
11.5 Curves, velocity, acceleration (2 days)

(Include a discussion of the cycloid (example 5, p. 647), deriving its parametric equations using vector addition. You might also want to discuss Kepler's Second Law a bit: In a central force field, $\mathbf{r}(t) \times \mathbf{v}(t)$ is constant; so the trajectory is planar and sweeps out area at a constant rate.)

II. Differentiation

12.2, 12.3 Graphs and level sets; limits and continuity (1 day)

(The subtleties of limits and continuity in several variables are better left for a more advanced course.)

12.4 Partial Derivatives (1 day)
12.5 Max/min problems (2 days)
12.6 Linear approximation (1 days)
12.7 The Chain Rule (2 days)
12.8 Directional Derivatives and the Gradient Vector (2 days)
12.9 Lagrange Multipliers (2 days)

(Emphasize the case of one constraint.)

12.10 Second derivative test (1 day)

III. Integration

13.1 Double Integrals over Rectangles (1 day)

(Perhaps pp. 496-7 should be done earlier to motivate iterated integrals.)

13.2 More general regions (1 day)
13.3 Area and volume (1 day)
9.2, 13.4 Double integrals in polar coordinates (2 days)

(Example 4 on p. 633 is important!)

13.5 Applications of Double Integrals (2 days)
13.6, 13.7 Triple integrals: cartesian, cylindrical, and spherical coordinates (3 days)

IV. Vector Integral Calculus

14.1 Vector fields, div, and curl (1 day)
14.2 Line integrals and work (2 days)
14.3 The Fundamental Theorem for Line Integrals (2 days)

(Include a careful discussion of conservative fields and the construction of potential functions.)

14.4 Green's Theorem (2 days)
14.5, 14.6, 14.7 Surface integrals, Divergence Theorem, Stokes' Theorem (3 days)

(Treat this material lightly, but try to get to it. Rather than discussing general parametrized surfaces, you might just limit yourself to planar, spherical, and cylindrical regions.)

This adds up to 40 days, allowing 5 days for exams and review.