MATH 243 – CALCULUS III SYLLABUS

Course Description: Vector algebra, vector-valued functions, differentiation in several variables, and optimization. 3 credits.

Prerequisite: a grade of C or better in 242 or 252, or a grade of B or better in 216, and 242L (or concurrent).

Text. *Calculus* by James Stewart, 4th edition.

Chapter 11: Parametric equations. (2.5 weeks)

The topics are curves defined by parametric equations, tangents, arc length and surface area. Cover sections 11.1–11.2, then sections 9.1 and 9.2, and then section 11.3. (The remainder of Chapter 11 will be covered in Math 244.) The text does not introduce the *tangent vector* until Chapter 13, but it would be very appropriate with section 11.2. Stewart's treatment of arc length is inadequate, and should be supplemented.

Chapter 13: Vectors and the geometry of space. (4 weeks)

Cover sections 13.1–13.6. (Section 13.7 will be included in Math 244.) Review vectors in $\Re^2$, then extend to $\Re^3$. Vector addition and scalar multiplication, dot product and cross product. The substance of the chapter is basic geometry in $\Re^3$: the equations of lines and planes, distance problems, cylinders and quadric surfaces.

Chapter 14: Vector functions. (3.5 weeks)

Cover the entire chapter: vector functions and space curves, derivatives and integrals of vector functions, arc length and curvature, velocity and acceleration. (Kepler's laws will be covered in Math 244.)

Chapter 15: Partial Derivatives. (5 weeks)

Differential calculus for scalar-valued functions of several variables. Graphing surfaces, limits and continuity. The text does not discuss the topology of the plane or space, but at least an elementary treatment is required for the correct statement of the theorems. Then cover partial derivatives, differentiability and tangent planes, followed by the chain rule, directional derivatives and the gradient. The Mean Value Theorem in several variables (not in the text) should be included. Finding and classifying extreme values of a function of several variables, including Lagrange multipliers for constrained optimization problems.

Date: December 23, 2003.