

Spring 2007

Math 243 – Calculus III Syllabus (3)

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

Prerequisite: a grade of C– or better in 242 or 252A, or consent.

Text. *Calculus Early Vectors* by James Stewart.

Chapter 11: Vectors, geometry of the plane and space, and vector valued functions. (10 weeks)

Cover the entire chapter. Do vectors in \mathbb{R}^2 and \mathbb{R}^3 more or less simultaneously. Vector addition, scalar multiplication, dot product and cross products. Equations of lines in \mathbb{R}^2 and \mathbb{R}^3 and equations of planes. Quadric surfaces. Vector valued functions and space curves.

Parametric equations in the plane should be done as an example of a vector valued function.

Arc length and curvature, velocity, and the components of acceleration for curves in space. Keplers laws of planetary motion (at the end of the chapter) can be covered as an application of the ideas introduced in the chapter.*

Chapter 12: 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.

Note: The treatment of Kepler’s first law requires the definition of polar coordinates and the description of conic sections in terms of them. This is covered in precalculus and may need to be reviewed. In the book, polar coordinates are treated in a subsequent chapter. Kepler’s second law (Exercise 29 on page 713) requires the formula for the area of a sector in terms of polar coordinates, which the instructor may have to provide.