STUDENT SYLLABUS

FOR

MATH 3334, ADVANCED MULTIVARIABLE CALCULUS

PREREQUISITES: MATH 3333

RECOMMENDED TEXT: *"VECTOR CALCULUS"*, 4TH Edition, by Marsden and Tromba, Freeman Publ. 1996

This is a first course in the basic theory and analysis underlying n-dimensional calculus. It will be important in preparing the student for any later courses involving analysis or calculus. There will be an emphasis on definitions, theorems and proofs.

SUGGESTED SYLLABUS

I. Topology of R^n

Including vectors in R^n, the Cauchy-Schwarz and triangle inequalities, convergent sequences in R^n, open and closed sets, the closure and boundary, (a short discussion of) compactness, connectedness, limits and continuity, continuity with respect to the properties of compactness and connectedness and the Extreme Value Theorem. (The instructor may have to supplement the discussion of the topology of R^n)

II. Multivariable differentiation.

Including scalar functions of class C^1 and C^k on an open set in R^n, the equality of mixed partial derivatives, Taylor's Theorem, extrema and the first and second derivative tests, the matrix-vector definition of the derivative of a function $f : D \subset R^n \to R^m$ (2.3 and 2.7 in the recommended text) and its implications, the Chain Rule and at least a statement and an illustration of the Inverse and Implicit Function Theorems (which are fully proved in Math 4332) .

III. Multivariable integration.

Including Riemann sums, the double and triple integral and their basic properties, Fubini's theorem, the Jacobian determinant and the change of variables formula. The emphasis is on rigorous definitions and (selected) proofs. Generalizations of the Fundamental Theorem of the Calculus, such as the Fundamental Theorem of Line Integrals, or the Divergence Theorem may be discussed if time permits.