FALL 1997

Syllabus for the Master's exam
Real Analysis

Topics:

1. Basic properties of the real numbers: **R** is an ordered field with the l.u.b. property.

2. Basic topological concepts defined on a metric space: open and closed sets, compact sets, connected sets, perfect sets, their fundamental properties.

3. Sequences and series of real or complex numbers and some convergence tests.

4. Real or complex-valued functions, limits, continuity, uniform continuity, differentiability, the Mean Value Theorem, l'Hospital's Rule, Taylor's Theorem with remainder, equicontinuity.

5. The integration theories of Riemann and Darboux, the Fundamental Theorems of Calculus.

6. Convergence and uniform convergence for sequences and series of functions; continuity, differentiability and integrability of their limits, Stone-Weierstrass theorem, power series, exponential and trigonometric functions defined as power series. the Gamma function.

7. The derivative for functions f: $\mathbf{R}^m \to \mathbf{R}^n$ and the basic properties for such derivatives, including the Chain Rule.

8. The Inverse Function Theorem and the Implicit Function Theorem.

9. The Riemann integral for **R**-valued functions defined on a suitable domain in $\mathbf{R}^n$ and its basic properties.

10. Partitions of unity and the Change-of-Variables Theorem.

11. The theorems of Green, Gauss and Stokes.

Most of these topics can be found in the following textbooks.
W. Rudin, Principles of Mathematical Analysis, Chapters 1-9.
M.H. Protter and C.B. Morrey, A First Course in Real Analysis, Chapters 1-9, 14, 16.
J.R. Munkres, Analysis on Manifolds, Chapters 2-7.
S.H. Weintraub, Differential Forms, A Complement to Vector Calculus, Chapters I-V.