Syllabus for M517, Fall, 2002

1. **Basic Topology**  
   *Chapter 2 of Rudin*  
   - Metric Spaces  
   - Compact Sets  
   - Connected and Convex Sets

2. **Numerical Sequences and Series**  
   *Chapter 3, pages 47-57 of Rudin*  
   - Convergent Sequences  
   - Subsequences  
   - Cauchy Sequences and Completeness  
   - Upper and Lower Limits

3. **Continuity**  
   *Chapter 4 of Rudin*  
   - Limits of Functions  
   - Continuous Functions  
   - Continuity and Compactness  
   - Continuity and Connectedness  
   - Discontinuities  
   - Monotonic Functions  
   - Infinite Limits and Limits at Infinity

4. **Differentiation**  
   *Chapter 5 of Rudin*  
   - The Derivative of a Real Function  
   - Mean Value Theorems  
   - The Continuity of Derivatives  
   - Derivatives of Higher Order  
   - Differentiation of Vector-Valued Functions  
   - Taylor’s Theorem

5. **The Riemann-Stieljes Integral**  
   *Chapter 6 of Rudin*  
   - Definition and Existence of the Integral  
   - Properties of the Integral  
   - Integration and Differentiation

6. **Sequences of Functions**  
   *Chapter 7 of Rudin*  
   - Discussion of the Main Problem  
   - Uniform Convergence  
   - Uniform Convergence and Continuity  
   - Uniform Convergence and Integration  
   - Uniform Convergence and Differentiation  
   - Equicontinuous Families of Functions  
   - The Weierstrass Approximation Theorem
7. **Functions of Several Variables**

*Chapter 9 of Rudin, Chapters 10, 23 in DePree and Swartz, Chapter 2 in Spivak, Chapters 3 and 5 of Ortega and Rheinboldt*

- Linear Transformations
- Differentiation
- The Contraction Principle
- The Inverse Function Theorem
- The Implicit Function Theorem
- Derivatives of Higher Order
- Differentiation of Integrals
- Taylor’s Theorem
- Classification of Critical Points