

Math 331 – Introduction to Real Analysis (3)

A rigorous axiomatic development of one variable calculus. Completeness, topology of the line, limits, continuity, differentiation, integration.

Pre: 242 or 252A, and 321; or consent.

**Syllabus:**

- I. The real number system. The complete ordered field axioms with emphasis on completeness.
- II. Topology of the line
  - a. Open and closed sets
  - b. Compactness: Heine–Borel Theorem
  - c. Connected sets
  - d. Sequences and series of real numbers
- III. Limits and Continuity
- IV. Differentiation
  - a. Derivative rules
  - b. Mean Value Theorem
- V. Integration
  - a. Riemann Integral
  - b. Continuous functions are integrable
  - c. Fundamental theorem of calculus
- VI. Sequences and series of functions (*if time allows*)
  - a. Integration and differentiation
  - b. Power series

**Suggested textbook:**

E. D. Gaughan, *Introduction to Analysis*, American Mathematical Society.

**Course Objectives.** Upon successful completion of Math 331, the student will have an understanding of the basic theory of topology of the real line, and one-dimensional Calculus.

**Program Objectives.** The successful student will have learned the first junior course in analysis, central to mathematics and many of its applications. There is an emphasis on understanding and writing proofs. Examples and counterexamples contribute to the understanding of the course material, and some reading without supervision is expected.