MA504 REAL ANALYSIS

PURDUE UNIVERSITY SPRING 2012

Instructional Format: Lecture meets 2 times per week for 75 minutes per meeting for 16 weeks. Credits: 3.00


Description: Completeness of the real number system, basic topological properties, compactness, sequences and series, absolute convergence of series, rearrangement of series, properties of continuous functions, the Riemann-Stieltjes integral, sequences and series of functions, uniform convergence, the Stone-Weierstrass theorem, equicontinuity, and the Arzela-Ascoli theorem.

Prerequisites: Upper division undergraduate level course work in Mathematics, General or Upper division undergraduate level course work in Engineering, General; for a total of two courses. Authorized equivalent courses or consent of instructor may be used in satisfying course pre- and co-requisites.

Topics

○ Chapter 1. The Real and Complex Number System
  – Real number system - (Emphasize inf, sup)
  – Extended real number system
  – Euclidean spaces

○ Chapter 2. Basic Topology
  – Finite, countable and uncountable sets
  – Metric spaces (Only a few special examples)
  – Compact sets

○ Chapter 3. Numerical Sequences and Series
  – Convergent sequences
  – Subsequences
  – Cauchy sequences
  – lim sup x_n and lim inf x_n
  – Series
  – Series with many terms (comparison test)
  – Absolute and conditional convergence
  – Rearrangements

○ Chapter 4. Continuity
  – Limits of functions

  – Continuous functions
  – Continuity and compactness
  – Intermediate Value Theorem

○ Chapter 6. The Riemann-Stieltjes Integral
  – Definition and existence
  – Properties
  – Integration and differentiation

○ Chapter 7. Sequences and Series of Functions
  – Uniform convergence
  – Uniform convergence and continuity
  – Uniform convergence and integration
  – Uniform convergence and differentiation
  – Equicontinuous families of functions
  – Stone-Weierstrass Theorem

○ Optional Topics.
  – Sets of Lebesgue measure zero
  – Characterization of Riemann integrable functions bounded and continuous a.e.
  – Differentiability a.e. of monotone functions