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

Text: W. Rudin, Principles of Mathematical Analysis, Third Edition, McGraw-Hill, New York, 1976

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
 - $\limsup x_n$ and $\liminf x_n$
 - 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