ROWAN UNIVERSITY
Department of Mathematics

Syllabus

Math 01.510 Real Analysis I

CATALOG DESCRIPTION:

Math 01.510 Real Analysis I 3 s.h.
(Prerequisite: Math 01.330 or permission of instructor)

This course deals with the theoretical treatment of the foundations of calculus. Topics covered include the real number system, number sequences and series, continuity, differentiation, Riemann integration, and sequences & series of functions.

OBJECTIVES:

The purpose of this course is to provide students an opportunity for a rigorous treatment of analysis. The intention is to effect a transition from elementary calculus where a considerable part of the effort is necessarily devoted to mastering the technical aspects of differentiation and integration. The emphasis thus shifts to the development of concepts and methods of proof. The student should be adequately prepared by this course to continue with other branches of analysis such as complex variable theory and topology.

CONTENT:

1. Properties of the Real Numbers

2.1 The complete ordered field definition
2.2 Denseness of the rationals and irrationals
2.3 Countable and uncountable sets
2.4 The completeness property

3. Sequences of Real Numbers

3.1 Sequences and their limits
3.2 Cauchy sequences, subsequences, monotone sequences
3.3 Limit superior and limit inferior

4. Series of Real Numbers

4.1 Convergence and divergence
4.2 Series with nonnegative terms
4.3 Alternating series
4.4 Conditional convergence and absolute convergence
4.5 Rearrangement of series

5. Continuity

5.1 Definitions and elementary theorems
5.2 Uniform continuity
5.3 Relative and absolute extrema
5.4 Intermediate value property

6. Differentiability

6.1 Definition and elementary properties
6.2 Conditions for differentiability
6.3 Derivatives of composite functions, chain rule
6.4 Mean value theorems
6.5 L'Hospital's rule

7. Riemann Integration

7.1 Definition of Riemann integrability
7.2 Elementary properties of the Riemann integral
7.3 Fundamental theorem of Calculus

8. Sequences and Series of Functions

8.1 Pointwise and uniform convergence of sequences of functions
8.2 Consequences of uniform convergence
8.3 Convergence and uniform convergence of series of functions
8.4 Differentiation and integration of series of functions

TEXTS:

The following are indicative of texts suitable for this course:

1) Goldberg, Richard, METHODS OF REAL ANALYSIS, 2nd edition, John Wiley & Sons, 1976

2) Brabenec, Robert, INTRODUCTION TO REAL ANALYSIS, PWS-Kent Publishing Company, Boston, MA, 1990.

3) Kirkwood, James, AN INTRODUCTION TO ANALYSIS, PWS-Kent Publishing Company, Boston, MA, 1989.

4) Walter Rudin, PRINCIPLES OF MATHEMATICAL ANALYSIS, McGraw - Hill, NY, 1964.