

**MATHEMATICAL ANALYSIS I**  
**MATH 4230/8236**

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**1.0 Course Description**

**1.1 Overview of Content and Purpose:** (3 hours) Provides a theoretical foundation for the concepts of elementary calculus. Topics include ordered fields and the real number system, basic properties of complex numbers, metric space topology, Sequences and series in  $\mathbb{R}^k$ , limits and continuity in a metric space, monotonic functions.

**1.2 For whom Intended:**

**1.3 Prerequisite:** MATH 3230/8235 or equivalent

**2.0 Objectives**

**2.1 Performance Objectives for the Student:** To provide students with a theoretical foundation for the concepts of advanced calculus and to provide the background for more advanced courses in analysis.

**3.0 Content and Organization**

**3.1 Topics**

1. Real and complex number systems, ordered fields
2. Elementary topology
  - a. Euclidean n-space
  - b. Metric spaces
  - c. Compactness (in either setting), Bolzano-Weierstrass Theorem, Heine Borel
3. Limits and Continuity (metric space)
4. Differentiation in  $\mathbb{R}$
5. Infinite series and infinite products

**4.0 Teaching Methodology**

**4.1 Methods to be Used:** The class will be presented in lecture/discussion form with student questions and discussion encouraged. Graduate students will be required to complete assignments not required of undergraduates.

**5.0 Evaluation**

**5.1 Basis for Evaluating Student Performance:** The grade will be determined primarily from examinations and problem assignments as determined by the instructor.

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**6.0 Resource Material**

**6.1 Textbook(s)  
or Other  
Required  
Readings:**

**6.2 Current  
Bibliography  
of Resources:**

Apostol, T.M., *Mathematical Analysis*, Addison-Wesley, 1957.

Bartle, R.G., *The Elements of Real Analysis*, John Wiley and Sons, 1964.

Gelbaum, J.M. and Olmsted, B.R., *Counter Examples in Analysis*, Holden Day, 1964.

Olmsted, J.M.H., *Real Variables*, Appleton-Century-Crofts, Inc., 1956

Royden, H.L., *Real Analysis*, 2<sup>nd</sup> edition, MacMillan, 1968.

Rudin, W., *Principles of Mathematical Analysis*, 3<sup>rd</sup> edition, McGraw-Hill, 1976.