

MATHEMATICAL ANALYSIS II
MATH 4240/8246

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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 differentiation and Riemann-Stieltjes Integration, sequences and series of functions, uniform convergence, power series, functions of several variables, Implicit Function Theorem.
- 1.2 For Whom Intended:** The course is intended for both undergraduate and graduate students.
- 1.3 Prerequisites:** MATH 4230/8230

2.0 Objectives

- 2.1 Performance Objectives for the Student:** To provide the 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:

- I. Riemann-Stieltjes integration in \mathbb{R} .
 - a) Existence criteria for the integral
 - b) Further properties of the integral
 - c) Improper and infinite integrals
 - d) Uniform convergence and infinite integrals

- II. Sequences and series of function (in \mathbb{R}^p , but primarily in \mathbb{R})
 - a) Pointwise convergence
 - b) Uniform convergence
 - c) Consequences of uniform convergence
 - d) Power series (including Taylor)

- III. Differentiation in \mathbb{R}^p

- IV. Implicit and rank theorem

- V. Integration in \mathbb{R}^p

- IF TIME PERMITS
 - Limit superior and inferior
 - Stone-Weierstrass approximation theorems
 - Cesaro summation and iterated limits

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4.0 Teaching Methodology

- 4.1 Methods to be Used:** The course will be presented in the lecture/discussion form with the students free to ask questions at any time. The students are encouraged to ask questions on the lecture or on the problem assignments that are given or on any of the problems in the book.

5.0 Evaluation

- 5.1 Basis for Evaluating Student Performance:** Students will be evaluated on the basis of a combination of homework assignments, several tests during the semester, and one comprehensive final examination during finals week.
- The problem assignments will count the same as one of the semester examinations. The final exam being longer and comprehensive will count for more. Since several people will be teaching this course, the exact weighting will be up to the particular professor teaching the course. Since several people will be teaching this course, no definite grading scale can be given. It is a requirement of the department that professors, early in the semester, tell the students how they will be graded in the course. Graduate students will be given additional homework assignments.

6.0 Resource Material

- 6.1 Textbook(s) or Other Required Readings:** Protter, *A First Course in Real Analysis*, Springer Verlag, 1997.
- 6.2 Current Bibliography of Resources:**
1. Apostle, T.M., *Mathematical Analysis*, Addison Wesley, 1957.
 2. Gelbaum, J.M., and Olmsted, B.R., *Counter Analysis in Analysis*, Holden Day, 1964.
 3. Olmsted, J.M., *Real Variables*, Appleton-Century-Crofts Inc., 1956.
 4. Royden, H.L., *Real Analysis*, 2nd edition, MacMillan, 1968.
 5. Rudin, W., *Principles of Mathematical Analysis*, 3rd edition, McGraw-Hill, 1976.