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Course Syllabus

MATH 451: Analysis I

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Description: *Properties of real numbers, theory of continuity, differentiation and integration of real valued functions of a real variable, sequences, series, and uniform convergence.*

Credit Hours: 3

Frequency: Offered in the spring semester of even-numbered years

Audience: 400-level elective for mathematics majors

Prerequisites: MATH 132 and MATH 266

Format: 3 class sessions (50 min each) per week

Textbook: *Introduction to Real Analysis* by William Trench
(PDF posted on Blackboard)

Technology: Course material and grades are maintained in Blackboard.

AARC: The Access and Accommodations Resource Center (AARC) is the campus office that works with students to provide access and accommodations in cases of diagnosed mental or emotional health issues, attentional or learning disabilities, vision or hearing limitations, chronic diseases, or allergies. You can contact the office at aarc@valpo.edu or 219.464.5206. Students who need, or think they may need, accommodations due to a diagnosis, or who think they have a diagnosis, are invited to contact AARC to arrange a confidential discussion with the AARC office. Further, students who are registered with AARC are required to contact their professor(s) if they wish to exercise the accommodations outlined in their letter from the AARC.

Notice of Cancellation: In the unlikely event class is cancelled, you will be notified through your Valparaiso University e-mail account.

Student Learning Objectives:

A. Students develop an understanding of the properties of the real number system beyond that of a Calculus I-II level.

B. Students develop an understanding of the properties of real functions beyond that of a Calculus I-II level.

C. Students improve their ability to independently read and understand mathematics, especially proofs.

D. Students improve their knowledge of proof techniques and ability to write well-structured proofs.

Topical Objectives:

Students will learn about the following topics:

1. The Real Numbers (Ch. 1 of textbook):
   the axiomatic description of the real number system as the unique complete ordered field, with special emphasis on the completeness axiom; the elementary topology of the real line

2. Limits and Continuity of Functions (Ch. 2 of textbook):
   the definition and elementary properties of limits of functions; continuity; the fundamental facts concerning continuous functions on intervals (e.g., Intermediate Value Theorem, Maximum-Minimum Theorem, continuity of inverse functions, uniform continuity on closed intervals)

3. Differential Calculus (Ch. 2 of textbook):
   the definition and geometric significance of the derivative; differentiation rules; the Mean Value Theorem and its consequences; L'Hospital's rule; Taylor's Theorem

4. Integral Calculus (Ch. 3 of textbook):
   the definition and elementary properties of the Riemann integral; the integrability of continuous functions and monotone functions; the Fundamental Theorems of Calculus

5. Sequences and Series (Ch. 4 of textbook):
   the definition and elementary properties of sequential limits; subsequences and accumulation points; monotone sequences; inferior and superior limits; the Bolzano-Weierstrass Theorem; sequences of functions; pointwise and uniform convergence; power series