MATH 3210 Foundation of Analysis I

SYLLABUS

Credits: Four

Coordinator: Tommaso de Fernex, JWB 322, 581-7121, defernex@math.utah.edu

Textbook: Joseph L. Taylor, Foundations of Analysis, American Mathematical Society, Providence 2012. ISBN 978-0-8218-8984-8

Prerequisites: "C" or better in ((MATH 2210 or MATH 1260 or MATH 1280 or MATH 1321 or MATH 3140) and (MATH 2200 or MATH 2270 or MATH 2250))

General Goals: The main goal of this course is twofold: to provide students with a rigorous approach to the theory of several variable calculus and to teach them the essentials of the professional mathematician: logic, proof and the writing of a mathematical argument. This is the first course of the MATH 3210–3220 sequence on *Foundations of Analysis*, a sequence designed to develop the mathematical sophistication of students, while giving them a much deeper understanding of calculus and its foundations than can be provided by the standard courses (MATH 1210, 1220, and 2210). In this sequence, the students are given a rigorous development of calculus. The emphasis is on improving the students' ability to understand and explain concepts in a logical and complete manner and refine their skill at proofs and mathematical argument. Incidental to this goal, students gain a broad exposure to the special mathematical notation, terminology, and thought processes used by professional mathematicians. Students who finish both semesters of the sequence should have the mathematical knowledge and sophistication necessary to do well in 4000 and 5000 level mathematics courses.

Bachelor Degree Requirement Met: This course meets the BS Quantitave Intensive (QI) requirement. This course addresses the following Essential Learning Outcomes: Inquiry and Analysis, Critical Thinking, Problem Solving.

Course Description: The course begins with a rigorous approach to the real-number system through Peano's axiomatic definition of the natural numbers and the construction of the real line as a complete ordered field. The theory of one variable calculus is then developed, from convergence, limits and continuity, all the way through differentiation and integration for functions of one variable. The Mean Value Theorem and the Fundamental Theorem of Calculus are proved and applied to problems in the context of real analysis. Some exposure to the topological properties of subsets of the real line is given while studying sequences and functions in one variable. The course covers most or all of the following chapters from the textbook:

  – Chapter 1: The Real Numbers
  – Chapter 2: Sequences
  – Chapter 3: Continuous Functions
  – Chapter 4: The Derivative
  – Chapter 5: The Integral
  – Chapter 6: Infinite Series

Coursework and Grading: Grading is based on homework, mid-term exams, and a final comprehensive exam. Homework is assigned on a weekly basis; many of the homework exercises involve

proving theorems or providing examples that illustrate the course material. Similar problems are given in the exams. Grading is based on the following or similar evaluation method:

    – Weekly homework assignments, counting 30% toward the final grade.
    – Two in-class midterms, each counting 20% toward the final grade.
    – Final exam, counting 30% toward the final grade.

The lowest two homework grades are dropped.

ADA: The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. Students are encouraged to approach the instructor and the Center for Disability Services to make suitable arrangements if needing special accommodations.