Course title: *MA715 – Analysis II: Measure and Integration Theory*

Instructor: Patrick L. Combettes, SAS-3276, 919-515-2671, plc@math.ncsu.edu

Term: Spring 2025

Time: Tuesdays and Thursdays, from 16:30 to 17:45

Office hours: Tuesdays and Thursdays from 11:35 to 12:35 (or anytime by appointment)

Course description: This course is intended to provide an introductory account of the basic results of measure and integration theory.

Prerequisite: MA515

Detailed content:

• Topology background • Sequences of sets • σ-algebras • Borel σ-algebra • Measures • Complete measure spaces • Outer measures • Carathéodory's theorem • Lebesgue-Stieltjes measures and distribution functions • The Lebesgue measure • Measurable functions • The Riemann integral • Construction of the abstract Lebesgue integral with respect to a measure • Main integration theorems • Background on convexity and normed vector spaces • L^p spaces: Main inequalities • L^p spaces: Completeness • Product measures • Fubini's theorem

Grading: Homework 30%, 2 exams (15% each), final exam 40%.

Reference material (no purchase necessary):

There are many excellent books on the classical topics of measure and integration. Here are a few examples for reference:

- R. B. Ash, *Measure, Integration, and Functional Analysis*. Academic Press, 1972.
- J. L. Doob, *Measure Theory*. Springer-Verlag, 1994.
- H. L. Royden and P. M. Fitzpatrick, *Real Analysis*, 5th ed. Pearson, 2023.
- W. Rudin, *Real and Complex Analysis*, 3rd ed. McGraw-Hill, 1987.