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

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

Term: Spring 2026

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

Office hours: By appointment

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

Pre/corequisite: MA515

Detailed content:

• Topology background • Sequences of sets • σ-algebras • Borel σ-algebra • Measurability • Measure spaces • Convergence modes • Outer measures • Carathéodory and Fréchet–Hahn–Kolmogorov extension theorems • Lebesgue–Stieltjes measures • The Riemann integral • Construction of the abstract Lebesgue integral in measure spaces • Main integration theorems • Decomposition of signed measures • Product measure spaces and Fubini's theorem • Background on convexity and normed vector spaces • L^p spaces: Main inequalities • L^p spaces: Completeness

Grading: Homework 30%, 1 midterm 30%, 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.
- P. Malliavin, *Integration and Probability*. Springer, 1995.
- H. L. Royden and P. M. Fitzpatrick, *Real Analysis*, 5th ed. Pearson, 2023.