NONABSOLUTE INTEGRATION ON MEASURE SPACES

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Key Features:
- To our knowledge there is no book on integration theory whose setting is measure spaces with a topological structure.
- The theory is developed in a progressive and elementary manner in that the fundamental properties are first established before further results are proved. That way, even though the setting is abstract, this book is accessible to any undergraduate who has done an advanced calculus course.
- The key idea behind each original concept is always explained in an intuitive manner before the formal definitions and results are presented in detail.

Description:
This book offers to the reader a self-contained treatment and systematic exposition of the real-valued theory of a nonabsolute integral on measure spaces. It is an introductory textbook to Henstock–Kurzweil type integrals defined on abstract spaces. It contains both classical and original results that are accessible to a large class of readers.

It is widely acknowledged that the biggest difficulty in defining a Henstock–Kurzweil integral beyond Euclidean spaces is the definition of a set of measurable sets which will play the role of “intervals” in the abstract setting. In this book the author shows a creative and innovative way of defining “intervals” in measure spaces, and prove many interesting and important results including the well-known Radon–Nikodym theorem.

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Contents:

- A Nonabsolute Integral on Measure Spaces:
  - Preliminaries
  - Existence of a Division and the $H$-Integral
  - Fundamental Properties of the $H$-Integral

- The Absolute $H$-Integral and the McShane-Type Integrals:
  - The Absolute $H$-Integral and the $M$-Integral
  - The $H$-Integral and the Lebesgue Integral
  - The Davies Integral and the Davies-McShane Integral

- Further Results of the $H$-Integral:
  - A Necessary and Sufficient Condition for $H$-Integrability
  - Generalised Absolute Continuity and Equi-integrability
  - The Controlled Convergence Theorem

- The Radon–Nikodym Theorem for the $H$-integral:
  - The Main Theorem
  - Descriptive Definition of $H$-integral
  - Henstock Integration in the Euclidean Space

- Harnack Extension and Convergence Theorems for the $H$-Integral:
  - The $H$-Integral on Metric Spaces
  - Harnack Extension
  - The Category Argument
  - Another Version of Controlled Convergence Theorem