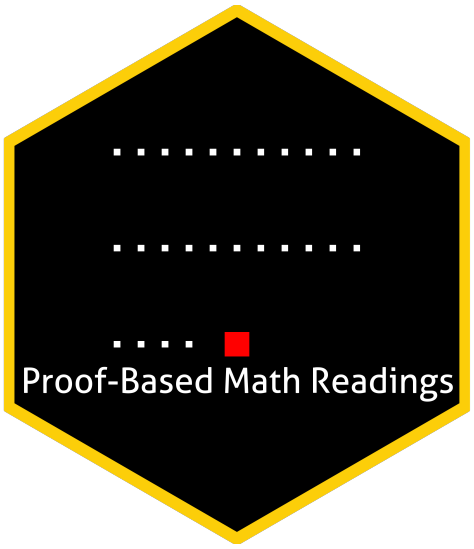
Proof-Based Math Readings
Session: Measure Theory
2025 Summer

Zeki Akyol*
Department of Economics
Istanbul Technical University
Click here for the most recent versions of the syllabuses

Version: 02 May 2024, 09:31 PM

Table of contents



*zekiakyol.com

0 Motivation

- *Proof-Based Math Readings* is a free and independent online reading group where we study mathematics required in economics master's/PhD programs using an intuitive approach.
- This session of the reading group is on *Measure Theory*.

1 Prerequisites

- CGPA: 3.00/4.00.
- Proof, Real Analysis, and Topology resources below are the prerequisites for this session.
- Please use the Application Form to join our reading group anytime.
- Applicants are informed about their application results within a week via email.

2 Format

- This session takes 12 weeks.
- We discuss the topics/exercises that we struggle with at Proof-Based Math Readings [Discord].
- We do not have face-to-face/online meetings due to the size of the group.
- Members are expected to read the chapters, and watch the chapter videos from the book's playlist.

3 Resources

3.1 Main Book and Main Book's Playlist

Measure, Integration & Real Analysis by Sheldon Axler is our main book for this session because it is well-written, well-structured, and open-access.

- Measure, Integration & Real Analysis - Sheldon Axler (2023, Errata-free version)
- Measure, Integration & Real Analysis - Sheldon Axler (2023) → will be added after the 2nd edition.

3.2 Supplementary

3.2.1 Measure Theory

- Measure Theory - The Bright Side of Mathematics (2024)
- Measure Theory - Indrava Roy (2020)

3.2.2 Topology

- Schaum's Outline of General Topology - Seymour Lipschutz (2011)
- General Topology - Bernard Badzioch (2020)
- Topology - Bruno Zimmermann (2016, Video 1-15)

3.2.3 Proof

- Book of Proof - Richard Hammack (3.3 Edition, 2022)
- Book of Proof - Richard Hammack (3.3 Edition, 2022, Companion playlist by Jeremy Teitelbaum)
- Book of Proof - Richard Hammack (3.3 Edition, 2022, Companion playlist by Michael Penn)

3.2.4 Real Analysis

- Measure, Integration & Real Analysis - Sheldon Axler (2023, Supplement)
- Basic Analysis I: Introduction to Real Analysis [Volume I] - Jiri Lebl (Version 6.0, 2023)
- Real Analysis - Casey Rodriguez (2020, Companion playlist to Basic Analysis I)
- Introduction To Metric Spaces - Paige Bright (2023)

4 Reading Schedule

- **MIRA** is the abbreviation of **Measure, Integration & Real Analysis - Sheldon Axler (2023)**.

MIRA, Chapter 1: Riemann Integration — **Week 01**

1A Review: Riemann Integral
1B Riemann Integral Is Not Good Enough

MIRA, Chapter 2: Measures — **Week 02-03-04-05**

2A Outer Measure on $\mathbf{R}$
2B Measurable Spaces and Functions
2C Measures and Their Properties
2D Lebesgue Measure
2E Convergence of Measurable Functions

MIRA, Chapter 3: Integration — **Week 06-07-08**

3A Integration with Respect to a Measure
3B Limits of Integrals & Integrals of Limits

MIRA, Chapter 4: Differentiation — **Week 09**

4A Hardy–Littlewood Maximal Function
4B Derivatives of Integrals

MIRA, Chapter 5: Product Measures — **Week 10-11-12**

5A Products of Measure Spaces
5B Iterated Integrals
5C Lebesgue Integration on $\mathbf{R}^n$

5 Further Readings (Optional)

You can check out our Measure Theoretic Probability syllabus at github.com/zekiakyol/proof-based-math-readings