

Proof-Based Math Readings

Session: Optimization

2024 Fall

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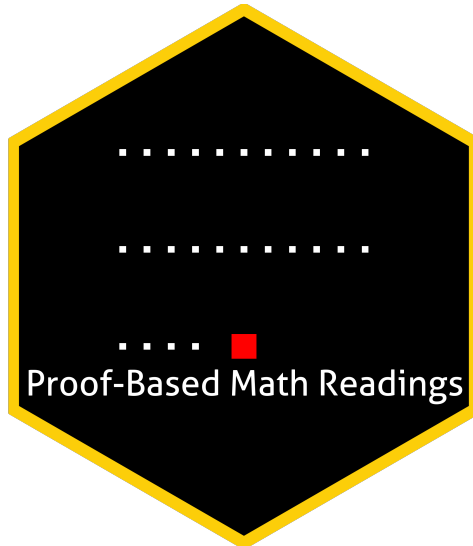
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[Click here for the most recent versions of the syllabuses](#)

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Table of contents

0	Motivation	2
1	Prerequisites	2
2	Format	2
3	Resources [All are open-access]	2
3.1	Main Book and Main Book's Playlist	2
3.2	Supplementary	2
3.2.1	Proof	2
3.2.2	Real Analysis	2
4	Reading Schedule	3



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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 *Optimization*.

1 Prerequisites

- CGPA: 3.00/4.00
- 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 from the book.

3 Resources [All are open-access]

3.1 Main Book and Main Book's Playlist

A First Course in Optimization Theory by Rangarajan K. Sundaram is our main book because it is a well-written and well-structured.




 A First Course in Optimization Theory - Rangarajan K. Sundaram (1996)

3.2 Supplementary

3.2.1 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)
-  Book of Proof - Richard Hammack (3.3 Edition, 2022, Companion workbook by Justin Wright)

3.2.2 Real Analysis

-  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

AFSOC is the abbreviation of **A First Course in Optimization Theory - Rangarajan K. Sundaram (1996)**.

📅 Week 01-02

- 📖 AFSOC, Appendix A: Set Theory and Logic: An Introduction
- 📖 AFSOC, Appendix B: The Real Line
- 📖 AFSOC, Appendix C: Structures on Vector Spaces
- 📖 AFSOC, Chapter 1: Mathematical Preliminaries

📅 Week 03-04

- 📖 AFSOC, Chapter 2: Optimization in \mathbb{R}^n

📅 Week 05-06

- 📖 AFSOC, Chapter 3: Existence of Solutions: The Weierstrass Theorem
- 📖 AFSOC, Chapter 4: Unconstrained Optima

📅 Week 07-08

- 📖 AFSOC, Chapter 5: Equality Constraints and the Theorem of Lagrange
- 📖 AFSOC, Chapter 6: Inequality Constraints and the Theorem of Kuhn and Tucker

📅 Week 09-10

- 📖 AFSOC, Chapter 7: Convex Structures in Optimization Theory
- 📖 AFSOC, Chapter 8: Quasi-Convexity and Optimization

📅 Week 11-12

- 📖 AFSOC, Chapter 11: Finite-Horizon Dynamic Programming
- 📖 AFSOC, Chapter 12: Stationary Discounted Dynamic Programming