

# THE CHINESE UNIVERSITY OF HONG KONG

Department of Mathematics

MATH5011 (Fall 2021)

## Real Analysis I

LECTURES: FRI 9:30AM–12:15PM, BASIC MED SCI BLDG RM1

Course Web Page : <http://www.math.cuhk.edu.hk/course/2122/math5011/>

### Introduction

The content of this course is: Abstract integration theory; outer measures and Caratheodory's construction, Borel, Radon and Hausdorff measures; positive linear functionals and Riesz representation theorem;  $L^p$ -spaces and their functional properties; and signed measures, Radon-Nikodym theorem and the dual of the space of continuous functions. Differentiation theory and Fubini's theorem will be discussed in Real Analysis II. Real Analysis I and II together provide a solid background on analysis that is essential for both theory and application.

When it comes to prerequisite, a rigorous  $\varepsilon$ - $\delta$ -approach to analysis and an undergraduate real analysis (Lebesgue measure and integration on the real line) are always assumed. In the past more than half of non-math majors taking this course dropped it after midterm. So think seriously before you register for this course. Some knowledge on point set topology and functional analysis will be helpful. After all, the most important thing is your interest and willingness to spend time on this subject.

The pace of this course is faster than an undergraduate course. We will skip some sections in order to cover most materials in 11 lectures.

Exercises will be uploaded on the course webpage and blackboard regularly. Model solutions will be posted in due time. As a graduate student, you should be more motivated; I trust that you will do at least half of the exercises, and study the model answers carefully. You must upload your answers in a PDF file to Blackboard (only handwritten answers on papers or electronic devices will be accepted). Mark deduction will be made for late submission.

There will be a midterm and a final examination.

### Instructor

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### Teaching Assistant

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## References

- *Real and Complex Analysis*, 3rd ed. W. Rudin, McGraw-Hill, New York 1966.
- *Measure Theory and Fine Properties of Functions*, L.C. Evans and R.F. Gariepy, CRC Press 1992.
- *Real Analysis: Measure Theory, Integration and Hilbert Spaces*, E.M. Stein and R. Shakarchi, Princeton Lectures in Analysis, Princeton 2005.
- *Real and Abstract Analysis*, E. Hewitt and K. Stromberg, Graduate Texts in Mathematics, Springer-Verlag, New York 1975.

## Grade

- 10% Assignments
- 45% Midterm Examination (October 29, Fri, 2021)
- 45% Final Examination (December 10, Fri, 2021)

## Honesty in Academic Work

The Chinese University of Hong Kong places very high importance on honesty in academic work submitted by students, and adopts a policy of zero tolerance on cheating and plagiarism. Any related offence will lead to disciplinary action including termination of studies at the University.

Although cases of cheating or plagiarism are rare at the University, everyone should make himself/herself familiar with the content of the following website:

<http://www.cuhk.edu.hk/policy/academichonesty/>

and thereby help avoid any practice that would not be acceptable.