

Real Analysis II

Ulrich Menne

31st December 2018

This course is a continuation of the course Real Analysis I which treated – apart of the necessary preparations from topology, metric spaces, and functional analysis – the following topics: measures, measurable sets, measurable functions, and Lebesgue integration (basic properties and limit theorems). The lecture notes on this course (see [Men18]) will be available and continued.

The core of the course Real Analysis II shall consist of the following topics treated in accordance with [Fed69]:

- (1) Lebesgue integration: integrals over subsets, Lebesgue spaces, composition and image measures, Jensen’s inequality.
- (2) Linear functionals: lattices of functions, Daniell integrals, linear functionals on Lebesgue spaces, Riesz’s representation theorem.
- (3) Product measures: Fubini’s theorem, Lebesgue measure.

Apart of this core, the necessary preparations from topology (locally compact Hausdorff spaces and Tychonoff’s theorem) and functional analysis (Hahn-Banach theorem and Banach-Alaoglu theorem) will be provided following [Kel75] and [DS58], respectively. If time permits, Riesz’s representation theorem shall also be put in the context of the theory of locally convex spaces following [Bou87].

References

- [Bou87] N. Bourbaki. *Topological vector spaces. Chapters 1–5*. Elements of Mathematics (Berlin). Springer-Verlag, Berlin, 1987. Translated from the French by H. G. Eggleston and S. Madan. URL: <https://doi.org/10.1007/978-3-642-61715-7>.
- [DS58] Nelson Dunford and Jacob T. Schwartz. *Linear Operators. I. General Theory*. With the assistance of W. G. Bade and R. G. Bartle. Pure and Applied Mathematics, Vol. 7. Interscience Publishers, Inc., New York; Interscience Publishers, Ltd., London, 1958. URL: <https://babel.hathitrust.org/cgi/pt?id=mdp.39015000962400;view=1up;seq=9A>.
- [Fed69] Herbert Federer. *Geometric measure theory*. Die Grundlehren der mathematischen Wissenschaften, Band 153. Springer-Verlag New York Inc., New York, 1969. URL: <https://doi.org/10.1007/978-3-642-62010-2>.

- [Kel75] John L. Kelley. *General topology*. Springer-Verlag, New York, 1975.
Reprint of the 1955 edition [Van Nostrand, Toronto, Ont.], Graduate
Texts in Mathematics, No. 27.
- [Men18] Ulrich Menne. Real analysis, 2018. Lecture notes, National Taiwan
Normal University.

AFFILIATION

Department of Mathematics
National Taiwan Normal University
No.88, Sec.4, Tingzhou Rd.
Wenshan Dist., TAIPEI CITY 11677
TAIWAN(R. O. C.)

EMAIL ADDRESS

Ulrich.Menne@math.ntnu.edu.tw