

Syllabus for “Functional Analysis”

Textbook: Functional Analysis, Peter D. Lax, Higher Education Press, 2007. Besides this reprint of English edition, there is also a Chinese translation of the book.

- Brief introduction to metric spaces. (Basic topological notions, such as open sets, compact sets; Arzela-Ascoli lemma; contraction mapping theorem; Baire category theorem; etc) (Basic reference is the notes by John Hunter available at: <https://www.math.ucdavis.edu/~hunter/book/pdfbook.html>)
- The following chapters in the textbook will be covered.
 1. Linear spaces
 2. Linear maps
 3. The Hahn-Banach Theorem
 - 3.1 The extension theorem
 - 3.2 Geometric Hahn-Banach theorem
 4. Applications of the Hahn-Banach Theorem
 - 4.1 Extension of positive linear functionals
 5. Normed linear spaces
 6. Hilbert spaces
 7. Applications of Hilbert space results
 8. Duals of normed linear spaces
 10. Weak convergence
 12. The weak and weak* topologies
 15. Bounded linear maps
 16. Examples of bounded linear maps
 17. Banach algebra and their elementary spectral theory
 20. Examples of operators and their spectra
 21. Compact maps
- If time permits, we will cover more topics in the textbook such as the theory on convex set, compact symmetric operators, etc.