H^p Spaces

PM 950

Course Outline

Instructor: Kenneth Davidson

Class times: TΘ 10:00–11:30 in MC 5403

Precis: This is the study of Banach spaces of analytic functions on the unit disk. The emphasis is on H^∞, H^2, H^1 and the disk algebra $A(\mathbb{D})$, but all H^p spaces follow the same theory with some special features at these three indices. It will cover boundary behaviour, inner–outer factorization, duality, the maximal ideal space of $A(\mathbb{D})$ and H^∞ including the corona theorem, and other topics as time permits, such as interpolating sequences.

The analysis of analytic functions on the unit disc is a model for studying function algebras on other domains. This theory is also fundamental to studying operators on Hilbert space in one and several variables. The uses of this basic theory and its analogues are ubiquitous.

Background needed: a course on analytic function theory and a course on measure theory are essential. Some basic functional analysis is also needed, but if you are taking it concurrently, that should suffice.

Reference Books: There is no required textbook, but I will be following material selected from the following books. They are all on reserve in the library.

- Kenneth Hoffman, *Banach spaces of analytic functions*, Dover reprint.
- John Garnett, *Bounded analytic functions*, Springer Grad. Texts in Math. 236.
- Paul Koosis, *Introduction to H_p spaces*, 2nd ed., LMS Lecture Note Series 115, Cambridge Univ. Press.
- Peter Duren, *Theory of H^p spaces*, Dover reprint.

Grading: Assignments 70%, Talk and Paper 30%

Outline

1. Harmonic functions, Fourier series and Fatou's theorem.
2. H^p spaces
3. Inner and outer functions
4. The disk algebra
5. H^∞ and the corona theorem
6. Interpolating sequences for H^∞