Course Description of Commutative Banach Algebras

What is Banach Algebras

Banach algebras are Banach spaces equipped with a continuous multiplition. In rough terms, there are three types of them: algebras of bounded linear operators on Banach spaces with composition and the operator norm, algebras consisting of bounded continuous functions on topological spaces with pointwise product and the uniform norm, and algebras of integrable functions on locally compact groups with convolution as multiplication.
These all play a key role in modern analysis. Much of operator theory is best approached from a Banach algebra point of view and many questions in complex analysis (such as approximation by polynomials or rational functions in specific mains) are best understood within the framework of Banach algebras. Also, the study of a locally compact Abelian group is closely related to the study of the group algebra L(G). There exist a rich literature and excellent texts on each single class of Banach algebras, notably on uniform algebras and on operator algebras.

Course Descriptions

This special course provides a thorough introduction to the theory of commutative Banach algebras and stresses the applications to commutative harmonic analysis while also touching on uniform algebras. In this sense and purpose the course folllows Larsen's classical text (Banach Algebras an Introduction) and which shares many themes and has been a valuable resource. However, for advanced graduate students and researchers, several topics from Part III of Walter Rudin's text (Functional Analysis) and Contempory Mathematics 363 (Banach Algebras and Their Applications) will be covered.

Course Contents

- Review of Prerequisites
- General Theory of Banach Algebras
- Gelfand Theory
- Functional Calculus, Shilov Boundary, and Applications
- Regularity and Related Properties
- Spectral Synthesis and Ideal Theory

Text Books

1. A Course in Commutative Banach Algebras, By Eberhard Kaniuth, Graduate Text in Mathematics, Springer-Verlag, 2009.
2. Functional Analysis, By Walter Rudin, International Series in Pure and Applied Mathematics, McGraw-Hill, 1991.
3. Banach Algebras and Their Applications, Contemporary Methematics, Vol 363, 2003