

MATH 663 - R.G. Douglas

In the first week of class I will present a somewhat expository account of the origins of the BDF Theory. This topic was developed to solve some very concrete problems in operator theory but has had far-reaching consequences in a variety of areas. In particular, for many points of view it was one of the gateways to non-commutative geometry and still plays a foundational role.

I will develop enough details and definitions to understand the problems and the results obtained but will not provide complete details during this overview.

It's always surprising when questions in one area of mathematics lead to results and breakthroughs in other areas. That was the case here. The starting point involved compact perturbations of operators on Hilbert space but led to the study of extensions of C^* -algebras and a realization of odd K-homology. The latter has applications to index theory and various problems in geometry, including Novikov Conjecture.

During the rest of the semester we will cover this ground in more detail, building the techniques and results needed for a more rigorous understanding of the results. Subsequent seminar courses in Spring and Fall 2016 by Zhizhang Xie and Guoliang Yu will take up these topics leading to the boundaries of current research.