

Math 595 OA: Advanced Topics in Mathematics, Fall 2009
Operator Algebras

Instructor: Zhong-Jin Ruan

Classroom: 143 Altgeld Hall, MWF 3:00-3:50pm

Office Hour: To be decided.

Office: 353 Altgeld Hall

Course Description:

This course will provide an introduction to the basic theory of C^* -algebras and von Neumann algebras. Our first goal is to comprehensively discuss some important approximation properties for C^* -algebras (such as nuclearity, exactness and related concepts). We then discuss some interesting properties for von Neumann algebras. Topics will include:

- Examples of C^* -algebras: finite dimensional C^* -algebras, AF-algebras, irrational rotation algebras, Cuntz algebras, and reduced and full group C^* -algebras.
- Constructions of new classes of C^* -algebras by tensor products and crossed products.
- Amenable groups and amenable actions of groups. Nuclear and exact C^* -algebras.
- Examples of von Neumann algebras: ICC group von Neumann algebras, group measure space construction, free and ergodic actions, infinite tensor products, the hyperfinite II_1 factor.

Prerequisite: Math 546: Hilbert Spaces, or approval of instructor.

Textbook: There is no required textbook.

References:

1. Bruce Blackadar: Operator Algebras, Springer 2006.
2. Nathaniel Brown and Narutaka Ozawa: C^* -algebras and Finite-Dimensional Approximations, AMS 2008.
3. John Conway, A Course in Functional Analysis, Springer 1990, 2nd Edition.
4. Kenneth Davidson: C^* -algebras by Example, AMS 1996.
5. Shôichirô Sakai, C^* -algebras and W^* -algebras, Springer 1971 (second printing 1998).
6. Masamichi Takesaki: Theory of Operator Algebras I, Springer 1979 (second printing 2002).