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ESI SENIOR RESEARCH FELLOW LECTURE COURSE

Summer Term 2011

Free Probability Theory
Prof. Kenneth Dykema (Texas A & M University) and
Prof. Roland Speicher (Universität des Saarlandes)
Start: Tuesday, February 22, 2011
Lectures: Monday, 14:00 - 16:00 and Tuesdays, 14:00 - 16:00
Seminar: Tuesday, 11:00 - 12:00, starting March 1, 2011
ESI, Erwin Schrödinger Lecture Hall

Free probability theory was invented by Voiculescu in the 1980 Rs and has seen huge development in the intervening time. Its fundamental point is to view the noncommutive phenomenon appearing in free groups from a probabilistic perspective. The resulting parallels with usual probability theory go unexpectedly far. Free probability theory has many applications to operator theory and operator algebras, and there are important connections with random matrices and combinatorics.

This course will introduce the theory and then cover the basic probabilistic, operator algebraic, combinatorial, and random matrix aspects of the subject, possibly also with an eye towards recent developments in the field and taking into account interests and background of the audience.

The first part of the course will be given by Ken Dykema, with some emphasis on operator algebraic aspects; the second part will be given by Roland Speicher, with some emphasis on combinatorial aspects.

Plan: We aim to cover the following topics in the course:

- the free central limit theorem
- free convolution
- freeness in random matrices
- freeness and the combinatorics of noncrossing partitions
- free products of operator algebras

Additional topics may include:

- free entropy and free entropy dimension
- free stochastic calculus

Joachim Schwermer
Scientific Director, ESI

The ESI Senior Research Fellow Programme is supported by the University of Vienna and the Austrian Federal Ministry of Science & Research. The programme is coordinated by Prof. Joachim Schwermer, Fakultät für Mathematik, Universität Wien, Nordbergstraße 15, A-1090 Wien (Joachim.Schwermer@univie.ac.at)