Mathematics Seminar
of the
University of Luxembourg
in cooperation with the
Luxembourg Mathematical Society

March 2007

6 March 2007 at 5 pm **Room 3.04 bs**

Hidenori Fujiwara
Kinki University

Intertwining operators for irreducible monomial representations of exponential groups

Abstract

In many aspects of representation theory, it turns out useful to get an explicit form of intertwining operators. In the framework of the orbit method for exponential solvable Lie groups, we are interested to construct explicitly an intertwining operator between two irreducible monomial representations constructed at the same linear form on the Lie algebra, starting from two polarizations satisfying the Pukanszky condition.

13 March 2007 at 6 pm **Room 0.03 bs**

Anton Thalmaier
University of Luxembourg
Public opening lecture

Brownian motion: from pollen grains in water to global geometry

Abstract

In 1828 Robert Brown, a famous nineteenth century botanist, published his microscopical investigations that dust grains suspended in water perform a rapid and highly irregular motion. With the most careful scrutiny, he ruled out that these erratic movements were signatures of life.

In 1905 Albert Einstein, unaware of the work of Brown, predicted the phenomenon on theoretical grounds, caused through a bombardment by the molecules of the liquid, and formulated a correct quantitative theory of it.

It is remarkable that already 5 years before Einstein, in 1900 Louis Bachelier defended at the Sorbonne his thesis "Thorie de la Speculation" in which the mathematical theory of Brownian motion is initiated and used for the modeling of price movements and evaluation of contingent claims in financial markets.

During the last 100 years Brownian motion became not only the keystone of a fully probabilistic formulation of statistical mechanics, as well as for financial engineering on the stock markets, in mathematics it grew to an universal object that lies at the interface of Analysis, Geometry and Probability. Brownian motion feels curved spaces and helps to connect local and global geometry. In our talk we give a small panorama of some examples.

13 March 2007 at 6:45 pm **Room 0.03 bs**

Martin Olbrich
University of Luxembourg
Public opening lecture

Fourier series and their generalisations: a glimpse of harmonic analysis

Abstract

About 200 years ago investigations of vibrating strings led to the discovery that quite arbitrary periodic functions on the real axis should be representable as infinite sums of elementary oscillations, i.e., of sine and cosine functions. Nowadays, these infinite sums are called Fourier series, after Joseph Fourier (1768-1830). The theory of Fourier series, which has found numerous applications in technics and physics is the prototype of (commutative) harmonic analysis. The word commutative refers to the commutativity of addition of real numbers.

We will explain the basic ideas of this theory and present some surprising mathematical applications of it. Then we will leave the commutative world and explain by analogy questions of recent mathematical research that can be attacked by techniques of noncommutative harmonic analysis.

20 March 2007 at 5 pm **Room 3.04 bs**

Heinz Koenig
University of Saarbrücken

Stochastic processes under new concepts in measure theory

Abstract

The traditional concept of a stochastic process has - in case of an uncountable time domain - the problem that the domain of its canonical measure in the path space is much too small, so that one needs extensions (or versions) of an a priori unknown multitude. In the present talk, the author uses his recent work in measure and integration to produce a modified concept of a stochastic process. It replaces the canonical measure with a unique

new measure in the path space, which has a large domain and appears to have adequate properties. The two kinds of processes are in one-to-one correspondence when the state space is a Polish topological space. The new measure is then an extension of the previous canonical one.