GRADUATE LECTURES

This series of lectures aims at Master’s and PhD students in mathematics and offers a first glimpse into topics which are not routinely taught in our MSc/PhD programme. The emphasis is to introduce new concepts and techniques, and not to present full mathematical details.

Introduction to Jump Processes
Dr. Paolo Di Tella (HU Berlin, Germany)

Jump processes, in particular semimartingales, play a fundamental role in stochastic analysis. Aim of this lectures is to introduce graduate and PhD students into the topic. To make the understanding easier, we concentrate on Lévy processes (i.e. processes with homogeneous and independent increments), a special case of semimartingales. We consider the jump measure of a Lévy process and define the stochastic integral relatively to it. Then we establish the canonical representation for semimartingales which are Lévy processes, that is the Itô-Lévy decomposition.

Dates: 23.04.2015, 30.04.2015, 07.05.2015 Thursday, 13:00 - 14:30, WIL-A124

Stochastic Geometry
Dr. Lutz Muche (TU Dresden, Germany)

Examples describing geometric probabilities are given to introduce the mathematical foundation of Stochastic Geometry. The Poisson process, some further frequently used point processes, and the Boolean model as important basics are discussed. Characteristics of random geometrical structures (nearest neighbour distribution function, contact and chord length distribution functions, K-function, pair correlation function) are given. An overview about random tessellations is made, especially Voronoi and Delaunay tessellations and their properties. Applications in natural sciences and engineering are discussed. As an important special case some results for distributional properties of the Poisson Voronoi and Poisson Delaunay tessellation are presented.

Dates: 21.05.2015, 04.06.2015, 11.06.2015 Thursday, 13:00 - 14:30, WIL-A124

Diffuse Interface Models for Two-Phase Flow
Dr. Sebastian Aland (TU Dresden, Germany)

Multi-phase flow systems can be found almost everywhere around us, from aerospace engineering down to the cells of our body. Mathematical modeling is an essential tool to predict how such systems behave. In this course we will derive the governing equations for two-phase flow by energy variation arguments. We will then focus on diffuse-interface (phase field) models to discuss various aspects of contact line dynamics, surface tension and discretization.

Dates: 18.06.2015, 25.06.2015, 02.07.2015 Thursday, 13:00 - 14:30, WIL-A124

Stochastic Stability of Markov Models
Dr. Nikola Sandric (University of Zagreb, Croatia)

The class of Markov models is one of the central objects in the theory of stochastic processes. These processes have strong connection with other areas of mathematics (e.g. harmonic analysis, PDEs, graph theory, geometry, etc.) and they are also used to model many phenomena appearing in nature and engineering (e.g. the classical model of enzyme activity, population processes, automatic speech recognition systems, information processing, etc.). In my three lectures I aim to provide an overview of the theory of Markov models with an emphasis on their (stochastic) stability properties (transience, recurrence and ergodicity).

Dates: 09.07.2015, 16.07.2015, 23.07.2015 Thursday, 13:00 - 14:30, WIL-A124