STAT 547M - INTRODUCTION TO STATISTICAL MODELLING OF EXTREME VALUES
2011/2012 – Term 2

Course description: The statistical analysis of extreme values is of great importance in diverse fields of application, including finance and insurance, civil and reliability engineering, hydrology and environmental sciences. The largest insurance claims may lead to the insurer's insolvency; the highest sea-levels may cause floods. These examples illustrate situations in which it is of interest and concern not just the typical behaviour of the underlying physical process but rather the behaviour of its extremes. Since, by definition, extreme observations are rare, there is too little data for adequate statistical modelling and inference in the context of extremes. To address this challenge, one can rely on asymptotic theory, known as Extreme Value Theory (EVT). The aim of the course is to motivate and demonstrate the use of EVT and its extensions as a basis for extreme value data modelling, with a greater emphasis on data analysis and associated inference techniques.

The course material will comprise three components: (1) probabilistic development of asymptotic theory, (2) statistical modelling and inference, and (3) case studies of real data chosen based on students interests.

Prerequisites: Sufficient background in basic probability theory and statistics (Stat 547 and 560 or their equivalents). Some experience with statistical software Splus/R will be helpful.

References:

Beirlant, J., Goegebeur, Y., Segers, J., and Teugels, J., *Statistics of Extremes: Theory and Applications*, Wiley Series in Probability and Statistics, Wiley, Chichester, UK, 2004.

Coles, S. G., *An Introduction to Statistical Modeling of Extreme Values*, Springer Series in Statistics, Springer-Verlag, London, 2001.

Embrechts, P., Klueppelberg, C., and Mikosch, T., *Modelling Extremal Events for Insurance and Finance*, Springer-Verlag, Berlin, 1997.

Reiss, R.-D. And Thomas, M., *Statistical Analysis of Extreme Values with Applications to Insurance, Finance, Hydrology and Other Fields*, 3rd ed., Birkhaeuser Verlag, Basel, Switzerland, 2007.

Coursework: Several written assignments and a course project.