

# Directed Studies in Risk Analytics

A structured directed studies course in Risk Analytics with a focus on Catastrophe Modeling and Portfolio Analysis and Optimization. Through white-board lectures, selected readings, and two hands-on exercises the instructor will give a broad overview of the Risk Analytics area with the aim of bring students quickly to the level where they can address open research questions in the area.

**Professor:** Andrew Rau-Chaplin

**Dates:** Fall term 2011

**Meeting Time:** M/W 1:30 - 3:00 (Note we will not use this time every week)

**Start Date:** Monday September 12, 2011

**Meeting Place:** Risk Analytics Lab, Mona Campbell building

## Course Components

- Whiteboard lectures highlighting key topics in Risk Analytics - see Tentative Topics List
- Readings - Key application papers and background material of key techniques
- Two small hands-on exercises
  - Monte Carlo Simulation
  - Building a Simple Catastrophe Model
- Individual Research Project

## Tentative List of Topics

- Overview
  - Intro to Risk Analytics
  - Intro to Reinsurance
  - Intro to Monte Carlo Simulation
  - Reinsurance Basic Terms and Concepts
  - Reinsurance Contracts
    - Cat, LiveCat, Deadcat
    - Risk perspectives: Aggregate vs Excess of loss
    - Facilitative vs Treaty
  - Review of Statistical Concepts
- Catastrophe Modeling
  - Approaches to Cat Modeling
    - Aggregate vs Detailed
  - Detailed Catastrophe Models
  - Aggregate Catastrophe Models
  - Building a Detailed Earthquake Model
  - Tools: Modeling in MS Excel
  - Quantitative Measures of Risk (PML, VAR, TVAR)
  - Exposure Management
    - Industry vs Cedent
    - Disaggregation
  - Exposure Accumulations
  - Tools: SQL + OLAP
- Risk Analytics
  - Portfolio Management Techniques
  - Reinsurance Financial Terms

- Portfolio Pricing
  - Aggregate vs Per Occurrence
  - Marginal
  - SimGrid
- Dynamic Financial Analysis
  - Intro to DFA
  - An example DFA implementation
- Other Topics
  - Intro to Cat Bonds
  - Cat Bond Optimization
  - Risk Visualization
    - Spatial Roll-ups
    - Tools: Google Earth & KML

## Grading Scheme

- Whiteboard lectures attendance - 10%
- Readings and Questions - 20%
- Hands on exercises - 15%
- Project - 55%

**Note:** Undergraduate students should enrol in CSci4192 and consult with Dr. McAllister while Graduate students should enrol in CSci6901 and consult with Dr. Gao. While both groups of students will cover the same material lecture material and readings when it comes to marking more will be expected of those enrolled in the graduate section in line with the greater number of hours expected in a graduate course.

*The undersigned student confirms acceptance proposed course content and marking scheme:*

Name: \_\_\_\_\_ Student #: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

*Permission of the instructor to register*

Instructor: \_\_\_\_\_ (Dr. Rau-Chaplin) Date: \_\_\_\_\_