STAT 901 COURSE DESCRIPTION, Fall 2003

Instructor: Don McLeish, MC 6138, Ext. 5534.

The notes for this course will be available at the website
http://www.stats/uwaterloo.ca/~dlmcleis/s901
Since corrections and additions will be made on the fly you should not copy any more of these notes than you require at one time.

There is a large number of textbooks in probability that you may refer to in this course, some listed below. The first two books are recommended if your background in probability/analysis is light. Copies of Rosenthal are available in the bookstore. The books by Billingsley, Tucker, Williams and Durrett are more mathematical and of these, the treatment by Billingsley is the most complete. Royden is a classic book in Analysis and measure theory (but there is no probability). For basic mathematics, the real and complex numbers, set theory, sequences and series, limits and functions, consult the book by Rudin.

- Rosenthal, Jeffrey S. (2000) *A First Look at Rigorous Probability Theory.* World Scientific, London.
- Capinski, Marek and Zastawniak, Tomasz (2001) *Probability Through Problems* Springer, New York
- Taylor, J. C. (1996) *An Introduction to Measure and Probability.* Springer, New York.
- Billingsley, Patrick (1986) *Probability and Measure.* Wiley
- Chung, K. L. (1968) *A Course in Probability Theory.* Harcourt, Brace and World.
- Burrill , C.W. (1972) *Measure, Integration and Probability.* McGraw-Hill
- Tucker, H. (1967) *A Graduate Course in Probability.* Academic Press
- Rudin, W.A. *Principles of Mathematical Analysis.* McGraw-Hill
- Royden, H.L. *Real Analysis.* MacMillan
- Williams, David (1991)*Probability With Martingales.* Cambridge University Press
- Durrett, Richard (1996) *Probability Theory and Examples* (2nd Ed), Duxbury, New York

MAJOR TOPICS TO BE COVERED

Probability Spaces. Fields, sigma-algebras. Probability measures. extension of a measure to a sigma-algebra.

Independent Events. The Borel Cantelli Lemma. Basic zero-one law.

Random variables. Measurable functions. Definition of integral, expectation. Fatou's lemma, Dominate convergence.

Cumulative Distribution Functions. Absolutely continuous distributions. weak convergence of distributions.

Convolutions of distributions.

Chebychev's inequality.

Joint distributions, Product measures, and Fubini's Theorem.

Independent Random variables: Weak and strong law of large numbers.

Characteristic Functions. The Central Limit Theorem.

Conditional Expectation, Martingales, Sub, Super, Reverse martingales and convergence Theorems.

Law of Large Numbers, Central Limit Theorems.

Assessment

Students will be expected to prepare solutions to homework problems and present these to the class. In addition there will be one midterm test and a final exam. The mark will be allocated as follows:

Homework	20%
Midterm Test	20%
Final	60%

Normally the midterm test and final exam are based on problems that are available in the notes.