STAT 305 - STATISTICAL INFERENCE

Term 2, T & Th 2:00 – 3:20, GEOG 147   **Instructor: John Petkau, LSK 328**

Description: Review of probability theory. Sampling distribution theory, large sample theory and methods of estimation and hypothesis testing, including maximum likelihood estimation, likelihood ratio testing and confidence interval construction.

Prerequisites: STAT 200 or BIOL 300, and MATH/STAT 302, or at least 65% in MATH/STAT 302. One of STAT 200 or BIOL 300 is recommended.

Audience: 3rd and 4th year students majoring in any of the mathematical sciences, and advanced undergraduate and graduate students from other disciplines seeking an exposition of the basic elements of the techniques of statistical inference.

Textbook: *Mathematical Statistics and Data Analysis, 3nd edition* by John A. Rice. Duxbury, 2007.

Tentative Schedule of Topics:

1. Tools of Probability Theory (parts of Chapters 4, 5 and 6: 3 weeks)
   - Preliminaries: distributions, moment generating functions, Central Limit Theorem
   - Distributions Related to the Normal: bivariate normal, χ^2, t and F
   - Sampling from a Normal Population: distributions of sample mean and variance
   - The Delta Method: propagation of error

2. Estimation (Chapter 8: 5 weeks)
   - Introduction
   - Methods of Point Estimation: MM and ML
   - Large Sample Theory for Point Estimators
   - Confidence Intervals
   - General Principles of Estimation
   - The Bayesian Approach

3. Testing Hypothesis (Chapter 9: 3 weeks)
   - Elements of a Statistical Test
   - Likelihood and Generalized Likelihood Ratio Tests
   - Assessing Goodness-of-Fit

4. Additional Topics (2 weeks)
   - Comparing Two Samples (Chapter 11)
   - Analysis of Categorical Data (Chapter 13)

Quizzes: Tuesday, January 23, February 6, February 27, March 13 and March 27.

Grading: Roughly: Labs = 10%-20%, Quizzes = 40%, Final = 40%-50%.