Course: **MATH 3P85 (MATHEMATICAL STATISTICS II)**
Instructor: **J. Vrbik**
Office: **J410**
Phone: **905-688-5550 local 3298**
e-mail: **jvrbik@brocku.ca**
web site: **spartan.ac.brocku.ca/~jvrbik**

Topics to be covered

PART 1: Probability

Review of main concepts: Random experiment, sample space, events, Boolean algebra, probability rules; random variables (discrete and continuous) and their distributions (joint, marginal and conditional), pmf, pdf, cdf; expected value and moments (simple, central and factorial), mean, variance and covariance, correlation coefficient, PGF, MGF and characteristic function.

Common distributions: Discrete; binomial (extension to multinomial), geometric, negative binomial, Poisson, hypergeometric (extension to multivariate).
Continuous; uniform, exponential, gamma.

Sampling: Random independent sample from a distribution, sample mean and variance. Central-limit theorem, Normal distribution. Extension to bivariate case.

Transforming random variables: The pdf and cdf techniques; extension to bivariate and multivariate transformation, the Jacobian. Deriving *beta*, *chi-square*, *t, F* and Cauchy distributions. Sampling from Normal distribution.

Order statistics: Their univariate, bivariate and multivariate distributions, sample median. A few interesting limits and other examples.

PART 2: Statistics

Parameter estimation: Point estimator; consistency, efficiency, sufficiency, law of large numbers, Rao-Blackwell bound, MVUE. Maximum-likelihood estimator. (extension to several parameters).

Hypotheses testing (time permitting): Neyman-Pearson lemma, likelihood-ratio test.

Textbook: MATH 3P85 LECTURE NOTES
Extra reference: Hogg RV, McKean JW and Craig AT: "Introduction to Mathematical Statistics" Pearson

Marking Scheme:

Assignments (weekly)	**- 25% total**
Two Midterms	**- 15% each**
Final Exam	**- 45%**