Course Syllabus

Methods of Statistical Inference
960:563 Spring - 2015

Class Meets Tuesday: 6:40 PM – 9:30 PM
Hill Center 116 - Busch Campus

INSTRUCTOR: Andrew Magyar
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Office Hours: RUTCOR 161
Monday 7:00 PM – 9:30 PM

TEACHING ASSISTANT:
E-mail:
Office Hours:

COURSE DESCRIPTION: This course is a Master's level course on the mathematical theory of statistics. The goal of the course is to teach the principles and properties on which sound statistical procedures are based and how to apply them. This course is a cornerstone class in the Master's curriculum and makes up part of the theoretical section of the Master's Degree Qualification Exam.

CLASS STYLE: The class materials will be presented on slide decks, with the occasional supplementation of this material with computational examples in **R**. Lectures will be a mix of methodology, application and theory.

PREREQUISITES: None officially, but highly recommended: Math 151/135 (Calculus I), Math 152/136 (Calculus II), Math 251 (Calculus III – Multivariable Calculus), Math 250 (Introduction to Linear Algebra), Stat 211 (Statistics I), Stat 212 (Statistics II), Stat 582 (Probability Theory) or equivalent courses.

BACKGROUND KNOWLEDGE:
Calculus – Differentiation of Single/Multivariable Functions, Optimization of Single/Multivariable Integration of Single/Multivariable Functions

Probability – Probability, Events, Basic Set Operations on Events and Related Probability Rules, Conditional Probability, Random Variables (Discrete and Continuous), Probability Distribution/Mass Functions, Cumulative Distribution Functions, Expectation/Variance of Random Variables, Jointly Distributed Random Variables, Marginal and Conditional Distributions, Covariance/Correlation

Statistics – Sampling & Sampling Distributions (particularly i.i.d. sampling), Estimation (Sample Mean, Sample Variance/Standard Deviation, Sample Covariance/Correlation), Confidence Intervals (1-sided, 2-sided z-intervals/t-intervals for a population mean), Hypothesis Testing (Z-tests, t-tests, ANOVA, ANCOVA)

TEXTBOOK: Homeworks will be assigned from the Class Textbook
Department Text: *Mathematical Statistics with Applications,7th Edition*
Dennis D. Wackerly, William Mendenhall III and Richard L. Schaeffer, Brooks/Cole, 2008.
ISBN: 978-0-495-11081-1

RESOURCES:

Professor Paul Dawkins online notes: http://tutorial.math.lamar.edu/

Statistical Inference, 2nd Edition. George Casella & Roger L. Berger, Brooks/Cole 2002.
ISBN: 978-0-534-24312-8

ASSIGNMENTS: There will be homeworks assigned from the class textbook almost every week. These will be collected and graded. Collaboration on assignments is not only allowed, but encouraged. However, each student must submit his/her own unique write-up. Students caught sharing part of or all their write-ups will also split the grade received for the combined effort.

FINAL: There will be an in-class final. Make up tests will only be given under extreme circumstances.

LETTERS OF RECOMMENDATION: I am more than willing to write letters of recommendation on your behalf. However, bear in mind that the content of the letter is dependent on not only your class performance but also how well I know you as a student.

COURSE GRADING CRITERION

Grade	**Final Score**		**Weightings**	**Percentage**
A	$x \geq 90$		Homeworks	80%
B+	$90 > x \geq 85$		Final Exam	20%
B	$85 > x \geq 80$			
C+	$80 > x \geq 75$			
C	$75 > x \geq 70$			
D	$70 > x \geq 60$			
F	$60 > x$			

TOPICS COVERED

Theory of Point Estimation: Maximum Likelihood Estimation, Method of Moments, Unbiasedness, Loss Functions, Risk, Sufficiency, Completeness, Rao-Blackwell Theorem, Basu's Theorem, Cramer Rao lower bound.

Theory of Hypothesis Testing: Power Functions, The Likelihood Ratio Test, Neyman-Pearson Lemma, Monotone Likelihood Ratio, UMP Tests

Miscellanea: Moment generating functions, discrete distributions arising from the Bernoulli process, Order Statistics, Transformations of Bivariate Random Variables, Inference for the Normal Data and the Central Limit theorem.

If time permits: Bayesian Inference