THE UNIVERSITY OF
WISCONSIN-MILWAUKEE
Econ 458
Selected Topics in Economics
(Mathematical Statistics for Econometrics)

Professor Chuan Goh
Fall 2014

1 Basic Information

- Lectures will be held on Tuesdays and Thursdays from 4:00 to 5:15 PM.
- Lectures will meet in BOL B91.

2 Instructor Contact Information

- Professor Goh will hold office hours on Tuesday and Thursday afternoons between 2:30 and 3:30 in Bolton Hall, 3210 N. Maryland Ave., Room 890. He is also available outside official office hours by appointment.
- His office telephone number is (414) 229-3395.
- He can also be reached by e-mail at goh@uwm.edu.
3 Required Textbook


4 Course Description and Intended Learning Outcomes

This course is designed to prepare first-year Ph.D. students in economics and related fields for the study of theoretical econometrics. The course is essentially a mathematically rigorous introduction to mathematical statistics from its probabilistic foundations.

This is a three-credit course. Students should expect to put in a minimum of six hours of study per week outside scheduled class meetings in order to achieve the learning goals of this course.

5 Prerequisites

Officially: junior standing and consent of the instructor. Unofficially: admission to the Ph.D. program in economics, or consent of the instructor. This course assumes prior exposure to statistics at an introductory undergraduate level as well as college-level calculus and linear algebra. Students should have had prior exposure to mathematical arguments and proofs.

6 Homework

Problem sets based on theoretical concepts covered in class will be assigned throughout the semester. These assignments will not be graded, but their completion will be essential for success on the examinations.

7 Grading Scheme

Student grades will be based on three components:
1. Midterm Examination 1 ($M_1$), Thursday October 16th, 4:00 –5:15 PM, BOL B91: A test based on the material covered in class up to October 9th.

2. Midterm Examination 2 ($M_2$), Thursday December 4th, 4:00 –5:15 PM, BOL B91: A test based on the material covered in class from October 14th to November 13th.

3. Final Examination ($F$), Thursday December 18th, 3:00 –5:00 PM, BOL B91. This will be based on the material covered in class from November 18th to December 11th.

The final grade in this course will be determined by the average of the grades attained on $M_1$, $M_2$ and $F$.

8 Policies on Missed Examinations

Please read the following notices carefully:

1. There will be no “make-ups” for missing any of the three examinations. Students will receive a grade of zero for missing an examination unless they receive an accommodation from the instructor. Proper documentation will be required.

   Students who miss only one (1) examination and receive an accommodation will have their final grade determined as the average of the grades attained on the two examinations actually written.

   Students who miss more than one examination for any reason at all are strongly encouraged to take this course again at a later time.

2. Illness is the only generally acceptable reason for missing an examination. Students who are ill on the day of an exam should observe the following rules:

   (a) A note from a physician must be submitted to Professor Goh within seven days of the missed exam. This note must include the physician’s full address in the form of a stamp, business card or official letterhead. The physician must also supply a daytime telephone number. A note that is missing any of this information will not be accepted.

   (b) The physician’s note must establish that the student was examined and diagnosed at the time of the illness and not after the fact. A statement that merely confirms a report of illness made by the student for documentation by the physician will not be acceptable.
9 General University Policies

The UWM Faculty has adopted various general policies that govern the administration of this course. These policies are summarized on the document available at [http://www4.uwm.edu/secu/SyllabusLinks.pdf](http://www4.uwm.edu/secu/SyllabusLinks.pdf). Among other items, these policies govern the granting of accommodations for students with disabilities.

10 List of Topics

The aim is to cover most of the material in Chapters 1–5 of the textbook and to cover a selection of the material in Chapters 6–8. A detailed listing follows. This is naturally subject to change:

1. Probability theory (Chapter 1): September 2, 4, 9, 11
   (a) Essential concepts of set theory
   (b) Axiomatic foundations of probability theory
   (c) Combinatorics and probability calculations involving finite sample spaces
   (d) Conditional probability and independence
   (e) Random variables, distinction between discrete and absolutely continuous
   (f) Distribution, mass and density functions
   
   *Read Chapter 1*

2. Transformations and expectations (Chapter 2): September 16, 18, 23, 25
   (a) Distributions of transformations of a random variable
   (b) Expectations
   (c) Moments and their generating functions
   (d) Differentiation under the integral sign
   
   *Read Chapter 2*

3. Special distributions and inequalities (Chapter 3): September 30; October 2, 7
   (a) Discrete distributions
   (b) Continuous distributions
   (c) Exponential families
   (d) Important inequalities and identities
   
   *Read Sections 3.1, 3.2, 3.3, 3.4, 3.6*

4. Multiple random variables and more inequalities (Chapter 4): October 9, 14, 21, 23
(a) Joint and marginal distributions
(b) Conditional distributions and independence
(c) Bivariate transformations
(d) Hierarchical models and mixtures of distributions
(e) Covariance and correlation
(f) Multivariate distributions
(g) Important inequalities

Read Chapter 4

5. Random sampling and asymptotic approximations (Chapter 5): October 28, 30; November 4, 6
   (a) Basic notions, independent and identically distributed (iid) random variables
   (b) Sums of iid random variables
   (c) Sampling from normal populations
   (d) Order statistics
   (e) Asymptotic theory

Read Sections 5.1–5.5

6. Sufficiency (Chapter 6): November 11, 13
   (a) Basic notions of data reduction
   (b) Sufficiency principle
   (c) Sufficiency, minimal sufficiency, ancillarity and completeness

Read Sections 6.1 and 6.2

7. Point estimation (Chapter 7): November 18, 20, 25
   (a) Basic notions
   (b) Method of moments
   (c) Maximum likelihood
   (d) Bayes estimation
   (e) Methods of evaluation

Read Sections 7.1, 7.2.1–7.2.3, 7.3

8. Tests of hypotheses (Chapter 8): December 2, 9, 11
   (a) Basic notions
   (b) Likelihood ratio tests
   (c) Bayes tests
   (d) Methods of evaluation

Read Chapter 8