

# STA380.10 Mathematical Statistics for Applications SYLLABUS Spring, 2007

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TEXTBOOK: *Introductory Econometrics with Applications*  
(5<sup>th</sup> Edition) by Ramu Ramanathan

## **PREREQUISITES:**

1. Introductory statistics – a basic pre-calculus course in statistical methods. Familiarity with the concepts of mean, standard deviation, confidence interval, hypothesis test, correlation, linear regression will be assumed.
2. Calculus – a basic course in differential and integral calculus. Ability to differentiate and integrate common functions, use of differentiation to find maximum or minimum of a function, use of integration to find area under the plot of a function will be assumed.
3. Mathematical maturity – comfort with mathematical reasoning. This is more important than any specific statistical or mathematical subject-matter background.

**GOAL OF THE COURSE:** To develop the student's understanding of the mathematics behind the most common statistical methods required to read and write research papers in the functional areas of business. The intention is to remove the mystery of statistical methodology as a magical black box. The student will gain a foundational understanding of the methods and the ability to critically appraise why the theory makes a method appropriate in certain circumstances and inappropriate in others. The emphasis in the course will be theory for applications – not theory for theory's sake. If there is no application for a theory, we will not study it!

## **COURSE POLICIES**

### **1. GRADING:**

Three components of your work will be evaluated numerically:

Homework	250 points maximum
Papers	250 points maximum
Midterm Exam	200 points maximum
Final Exam	300 points maximum
<b>COURSE SCORE (Total)</b>	<b>1000 points maximum</b>

Your grade will be based entirely on your total points. At the end of the course, I will rank-order the COURSE SCORES from highest to lowest. I will then divide the ranked list into letter grade categories,

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based upon the level of mastery that I evaluate the points to represent. Plus (+) and minus (-) marks will also be assigned. There is no predetermined COURSE SCORE that will guarantee an A. There is no predetermined grade distribution. The exact number of A's, B's, etc. in this course will depend upon the efficacy of your efforts.

2. **HOMEWORK.** Homework will be assigned approximately once per week. Homework should be considered practice material to help reinforce your learning. To motivate your doing the homework, I will grade homework on effort. That is, you will receive full credit on every problem or part of a problem for which you make a *bona fide* effort, whether your solution is correct or not. You will receive zero points on every problem that you omit or for which your effort is *pro forma*. Problems with multiple parts may receive more points than problems with one part. The formula for the homework portion of your COURSE SCORE is total homework points earned  $\div$  total number of homework points assigned \* 250. You are permitted to work on the homework together and to *discuss* it among yourselves as much as you wish. But you are required to write up the solutions on your own. You may not exchange solutions or computer files with each other. Copying or editing the work of another is a violation of the Honor Code.

3. **PAPERS.** There will be approximately four graded take-home papers. The papers will include theoretical questions, data analyses to perform, and may refer to published literature. Each paper will be graded on a 100 point scale. Your scores on the papers will be pro-rated to a 250-point scale for the purpose of computing your COURSE SCORE according to the formula *total points earned on all papers*  $\div$  (*number of papers assigned* \* 100) \* 250. I require that the papers be entirely your own individual effort. In particular, no discussion or electronic exchanges of any type with other students are permitted.

4. **EXAMS.** The midterm exam is tentatively scheduled for Thursday, March 8. The final exam will be given at the date, time, and place published by the Registrar. According to preliminary information, the date and time for the final exam are Friday, May 11 from 9:00am – noon. But please check the official final exam schedule when it is published toward the end of the semester. The final exam will be comprehensive. For both the midterm and final exams, you may use a simple hand calculator and a limited amount of reference material (to be announced), but you may not use a computer.

5. **LATE ASSIGNMENTS.** Homework and papers are due on or before the date and time announced. Late homework or papers will not be accepted unless accompanied by acceptable written explanation and documentation of the true emergency that caused the lateness. Unavailability of a computer or other resource the day before a due date because of your procrastination is generally NOT an acceptable explanation. A late assignment that is not accepted will be recorded as zero points. A penalty may be applied to a late assignment that is accepted.

6. **SAS.** I use statistical software to illustrate implementation of statistical theory. In this course I will use SAS (Statistical Analysis System). SAS runs on many different computer platforms at UT: PCs, unix machines, and (limitedly) Macintosh machines. Although these platforms use different operating systems and file structures, the SAS language is “the same” for all platforms using the same version number of SAS. Therefore, in this course, you may use whichever platform you prefer. To provide some commonality, I will focus upon PCs running SAS v9.1 under the Windows (XP or 2000) operating system. You may buy your own SAS license from UT’s Software Distribution Services, or you may use

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SAS in one of the computer labs at UT, or you may use SAS on one of the time-sharing services at UT. Please see the information that I have posted on BlackBoard for details.

7. **COMPUTERS IN CLASS.** I use a laptop computer extensively in class as a means to organize important discussion points, to display data and analyses, and to show how to accomplish statistical tasks in SAS. Prior to each class, I will post on BlackBoard all of the files that will be used in that class. You may find it helpful to download these files and print them out and/or bring your laptop to class so that you can follow the class demonstrations and take notes. Having the files in front of you as we discuss them will maximize your learning.

8. **CLASSROOM COURTESY.**

- Turn off cell phones and pagers before entering class.
- Avoid arriving late to class.
- Mute the volume control on your laptop.
- Respect the questions and opinions of other students as you would have them respect yours.
- Avoid surfing the internet in class.

9. Unless otherwise announced, you are responsible for material assigned in the text whether or not that material is covered in class.

10. Unless otherwise announced, you are responsible for material covered in class and on handouts, emails, or BlackBoard postings whether or not it is in the text.

11. It is unfair to allow a student to raise his/her score by submitting extra work unless all students are allowed the same opportunity. Therefore, extra work for extra credit will not be permitted.

12. All students are expected to observe the Honor Code fully.

### TENTATIVE LIST OF TOPICS

MAJOR TOPIC		STUDY MATERIAL
1. Fundamental concepts and properties of mathematical statistics	4	Chapter 2 & Appendix 2
A. Random variable		
B. Multiple random variables		
C. Random sample		
D. Estimation		
2. SAS	1	Class material
3. Univariate regression	3	Chapter 3 and Appendix 3
4. Multivariate regression	3	Chapter 4 and Appendix 4
5. Multicollinearity	1	Chapter 5 and Appendix 5
6. Specification problems		
A. Non-normality	1	Class material
B. Omitted variables	1	Section 4.5
C. Nonlinearity	2	Chapter 6 and Appendix 6
D. Heteroscedasticity	2	Chapter 8 and Appendix 8
E. Autocorrelation	2	Chapter 9 and Appendix 9
F. Errors-in-variables	1	Class material
7. Lag variables and panel data	3	Chapter 10, Class material
8. Categorical data analysis		

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A. Table analysis	1	Class material
B. Logistic regression	2	Section 6.12, Chapter 12, Class material
9. Analysis of variance		Chapter 7, Class material
A. One-way and two-way ANOVA	1	
B. Interactions	1	