STA380.10 Mathematical Statistics for Applications SYLLABUS
Fall, 2011

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TA:	<None>
TEXTBOOK:	*Introductory Econometrics with Applications* (5th Edition) by Ramu Ramanathan

PREREQUISITES:

1. Introductory statistics – a basic calculus-level (preferred) or pre-calculus-level course in statistical methods. Familiarity with the concepts and properties of mean, standard deviation, confidence interval, hypothesis test, correlation, linear regression will be assumed in this course.
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 in this course.
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 mathematical foundations underlying the most common statistical methods required to read and write research papers in the functional areas of business and other fields. 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:**

Four components of your work will be evaluated numerically:

Part A Homework	250 points maximum
Part B Homework	250 points maximum
Midterm Exam	200 points maximum
Final Exam	300 points maximum
COURSE SCORE (Total)	**1000 points maximum**

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, 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 every week or two. Each homework assignment will be divided into two parts – Part A and Part B:

- **Part A Homework** should be considered practice material to help reinforce your learning. To motivate your doing Part A Homework, I will grade it 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. Each Part A Homework will be scored on a 100-point scale, with your points proportionately scaled up to 100. For example, suppose there are 8 possible points on Part A Homework #1. If you attempt 6 of them, then your Part A Homework #1 score would be 6/8 * 100 = 75. For the purpose of computing the Part A Homework portion of your COURSE SCORE, your scores on the Part A Homeworks collectively will be pro-rated to a 250-point scale according to the formula *total points earned on all Part A Homeworks* ÷ (*number of homeworks assigned* * 100) * 250 – this is the mean of your Part A Homework scores times 2.5. You are permitted to work together on Part A Homework 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.
- **Part B Homework** provides you the opportunity to work on problems on your own, without assistance from others. The idea is that you may work on Part A problems first, with others, to develop your skills and understanding – then tackle Part B to see how well you yourself have learned. Part B Homework will be graded on correctness, completeness, reasoning, work shown, etc. – not on effort. Each Part B Homework will be graded on a 100-point scale. For the purpose of computing the Part B Homework portion of your COURSE SCORE, your scores on the Part B Homeworks collectively will be pro-rated to a 250-point scale according to the formula *total points earned on all Part B Homeworks* ÷ (*number of homeworks assigned* * 100) * 250 – this is the mean of your Part B Homework scores times 2.5. I require that your Part B Homework submissions be entirely your own individual efforts. In particular, no discussion or electronic exchanges of any type with other students are permitted on Part B Homework assignments.

3. **LATE HOMEWORK.** Homework is due on or before the date and time announced. Late homework 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 homework that is not accepted will be recorded as zero points. A penalty may be applied to a late homework that is accepted.

4. **EXAMS.** The midterm exam may be scheduled for evening in mid-October (to be arranged). 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 Saturday, December 10 from 9:00 a.m. – 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. **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 operating system. There is little difference for the user among recent versions of SAS. You may buy your own SAS license from UT's Software Distribution Services, or you may use 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.

6. **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 electronically or as printouts as we discuss them will maximize your learning.

7. **CLASSROOM COURTESY.**
- Turn off cell phones, pagers, and other noisy electronic devices before entering class.
- Mute the volume control on your laptop.
- Avoid surfing the internet or answering email in class.
- Avoid arriving late to class.
- Respect the questions and opinions of other students as you would have them respect yours.

8. Unless otherwise announced, you are responsible for material covered in class and on handouts, emails, or BlackBoard postings.

9. 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.

10. **ACADEMIC DISHONESTY**. All students are expected to observe the UT Honor Code fully. Your responsibilities regarding the Honor System are described at http://deanofstudents.utexas.edu/sjs/spot_honorcode.php, which is incorporated herein by reference. I urge you to become familiar with this. If the application of the Honor System to this class and its assignments is unclear in any way, it is your responsibility to ask me for clarification.

11. **STUDENTS WITH DISABILITIES**. Upon request, the University of Texas at Austin provides appropriate academic accommodations for qualified students with disabilities. Services for Students with Disabilities (SSD) is housed in the Office of the Dean of Students, located on the fourth floor of the

Student Services Building. Information on how to register, downloadable forms, including guidelines for documentation, accommodation request letters, and releases of information are available online at http://deanofstudents.utexas.edu/ssd/index.php. Please do not hesitate to contact SSD at (512) 471-6259, VP: (512) 232-2937 or via e-mail if you have any questions.

TENTATIVE LIST OF TOPICS

MAJOR TOPIC	Hrs	STUDY MATERIAL
1. Fundamental concepts and properties of mathematical statistics	6	Chapter 2 & Appendix 2
A. Random variable		
B. Multiple random variables		
C. Random sample		
D. Linear combinations		
E. Estimation		
2. Intro to SAS	1.5	Class material
3. Univariate regression	4.5	Chapter 3 and Appendix 3
4. Multivariate regression	4.5	Chapter 4 and Appendix 4
5. Multicollinearity	1.5	Chapter 5 and Appendix 5
6. Specification problems		
A. Non-normality	1.5	Class material
B. Omitted variables	1.5	Section 4.5
C. Nonlinearity	3	Chapter 6 and Appendix 6
D. Heteroscedasticity	3	Chapter 8 and Appendix 8
E. Autocorrelation	3	Chapter 9 and Appendix 9
F. Errors-in-variables	1.5	Class material
7. Lag variables and panel data	4.5	Chapter 10, Class material
8. Logistic regression	3	Section 6.12, Chapter 12, Class material