Overview: This course is designed to provide a working knowledge of the analytical tools of probability and statistics used in economic analysis. Some of the topics that we will cover include descriptive statistics, probability theory, the Central Limit Theorem, confidence intervals and hypothesis testing. The course will conclude with an introduction to regression analysis: single variable and multivariable “line fitting,” ordinary least squares, estimation and inference.

Course Meeting Times: MWTH 11:00-noon, Sachar 130
Recitation: Wednesdays 6:30-8:30 p.m.
Office Hours: TBA
Email: hchwang@brandeis.edu


Other materials will be accessible on the internet or distributed in class.

Course Requirements and Grading Policy: Participation in lectures and recitation, the completion of course assignments, quizzes, one midterm, and a final exam. The quizzes and exams will be closed book, closed note. Grading in the course will be as follows:

1. Assignments and class participation (15% of the grade)— I will assign 6 assignments over the course of the semester. You are required to turn in all of these exercises. You must do these exercises on your own. Assignments will be due in class (due dates are given in the syllabus). NO late assignments will be accepted.

   Assignment #1, due Wed, Jan. 24.
   Assignment #2, due Wed, Jan. 31.
   Assignment #3, due Wed, Feb. 7.
   Assignment #4, due Mon, March 5.
   Assignment #5, due Wed, March 14.
   Assignment #6, due Wed, March 28.

   All homework assignments will be graded and recorded. Late homeworks lose 1 point (out of 3) per day. Note that assignments are late whenever submitted later than 14:00 on the due date. Late homework must be handed directly to me. DO NOT submit homework in the form of e-mail attachments.

   I expect that you will have read the assigned textbook material before coming to lecture. Class participation is strongly encouraged.
2. Quizzes (15% of the grade)—I will give several quizzes at the beginning of the class sometimes. The purpose of the quizzes is to keep you on track with the course. Quiz questions will be based on lecture notes and assignments.

3. Midterm exam (40% of the grade)—There will be 2 in-class midterm exams given during the semester, each worth 20%.

4. Final exam (30% of the grade)—to be held during the final exam period. The exam will be based on the textbooks, lecture notes, assigned readings, problem sets, and quizzes.

There will be absolutely no makeup quizzes; there is no scheduled make-up midterm or final exam. If you have any conflicts with any of the exams, please let me know ASAP. If you miss an exam without an acceptable legal document/reason (for example: a written certificate from a medical or legal authority), no makeup exam will be given.

Additional Requirements: You will be required to purchase a NON-PROGRAMMABLE calculator for this class. This will be the ONLY calculator that will be allowed for use in the exams. There will be no exceptions to this rule. This means that you may NOT bring in a programmable graphing calculator (whether or not you can show that there are no stored programs). Your calculator should be able to perform square roots, but nothing more complicated will be necessary. (In general, the $5 calculator available at a drugstore will suffice.) If your calculator does not meet these specifications during an exam, you will have to do without a calculator for the exam.

Academic Honesty: You are expected to be honest in all of your academic work. Potential sanctions include failure in the course and suspension from the university. If you have any questions about my expectations, please ask.

Disability Information: If you are a student with a documented disability at Brandeis University and if you wish to request a reasonable accommodation for this class please see me immediately. Please keep in mind that accommodations are not provided retroactively.

WebCT: Lecture notes, problem sets solutions and other relevant materials will be posted on WebCT for your convenience.

**TENTATIVE COURSE OUTLINE**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics and Assigned Readings</th>
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| Jan. 17 (Wed) | *Introduction: The role of probability and statistics in economic analysis.*  
Overview of the course. Introduction to the notion of “population” versus “sample.”  
Discussion on types of data: nominal, ordinal, interval, ratio. Describing data in a meaningful way through descriptive statistics: frequencies, relative frequencies, percentiles, measures of central tendencies.  
Read: W&W 1.1 - 1.3 |
Jan. 22 (Mon)  
*Introduction to Probability.* What is a “sample space?” What is an “event?”  
Manipulating the event space: intersections and unions of events. Compliments and mutually exclusive sets. Relationship between relative frequencies and probabilities.  
Read: W&W 2.1 2.3, 2.5-2.6

Jan. 24 (Wed)  
*An Axiomatic Approach to Probability.* Discrete versus continuous probability distributions.  
Read: W&W 3.1 - 3.3

Jan. 25 (Thr)  
*Conditional Probabilities.* Examples of conditional probabilities.  
Introduction to Bayes’ Theorem.  
Read: W&W 3.6-3.7

Jan. 29 (Mon)  
*Conditional Probabilities (continued).* More on Bayes’ Theorem.  
Examples. Introduction to random variables.  
Read: W&W 3.4-3.5

Jan. 31 (Wed)  
Read: W&W 4.1-4.2

Feb. 1 (Thr)  
Read: W&W 4.3

Feb. 5 (Mon)  
Read: W&W 4.4-4.5

Feb. 7 (Wed)  
Read: W&W 4.4-4.5

Feb. 8 (Thr)  
Review for midterm.
<table>
<thead>
<tr>
<th>Date</th>
<th>Event/Notes</th>
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<tbody>
<tr>
<td>Feb. 12 (Mon)</td>
<td>MIDTERM #1, IN CLASS.</td>
</tr>
<tr>
<td>Feb. 14 (Wed)</td>
<td>Return exam and go over solutions</td>
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<tr>
<td>Feb. 26 (Mon)</td>
<td><em>Functions of a Single and Several Random Variables, cont’d.</em> More on the Normal distribution (how to read the table.) Creating new random variables that are functions of several random variables. Constructing the probability distribution function for the new variable. Read: W&amp;W 5.1-5.2</td>
</tr>
<tr>
<td>Mar. 1 (Thr)</td>
<td><em>Covariance and Correlation.</em> Variance measures for functions of random variables. Measures of covariance and correlation between random variables. Interpretation of these measures. Read: W&amp;W 5.2-5.3</td>
</tr>
<tr>
<td>Mar. 7 (Wed)</td>
<td><em>Properties of Good Estimators.</em> Discussion of unbiasedness, efficiency and consistency. How do you determine if an estimator has these properties? Read: W&amp;W 7.1-7.4</td>
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<tr>
<td>Mar. 8 (Thr)</td>
<td><em>The Central Limit Theorem.</em> Probability distribution for the sample mean. Discussion of sampling issues.</td>
</tr>
<tr>
<td>Mar. 12 (Mon)</td>
<td><em>Confidence Intervals.</em> What is a confidence interval and what can it be used for? Constructing confidence intervals (two-sided). Setting the confidence level. Using the Z distribution. Read: W&amp;W 8.1-8.2</td>
</tr>
<tr>
<td>Mar. 14 (Wed)</td>
<td><em>Confidence Intervals, cont’d.</em> How to construct a one-sided confidence interval. What to do if the population variance is unknown. Using the Student t-distribution.</td>
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</tbody>
</table>
Exercise 5 due.

Mar. 15 (Thr)  
*Comparing Populations.* Comparing means of independent samples and paired samples.

Read: W&W 8.3-8.4

Mar. 19 (Mon)  
*Hypothesis Testing.* Designing a statistical test. The null and alternative hypothesis. Constructing a two-sided test using the confidence interval approach.

Read: W&W 9.1 - 9.3, 9.6

Mar. 21 (Wed)  
*Hypothesis Testing, contd.* Constructing a hypothesis test using the “test of significance” approach. Introduction to one-sided hypothesis testing.

Mar. 22 (Thr)  
*One Sided Hypothesis Testing, contd.* More on one-sided hypothesis testing. Using “p” values.

Mar. 26 (Mon)  
*Type I and Type II Errors.* What is the significance of Type I and II errors? Determining which one you might be committing. Calculating Type I and Type II errors.

Read: W&W 9.4-9.5

Mar. 28 (Wed)  
*Introduction to Econometrics.* Motivation. The idea behind “fitting a line.”

Read: W&W 11.1-11.3

Exercise 6 due.

Mar. 29 (Thr)  
Review for Midterm #2.

Apr. 9 (Mon)  
**Midterm #2 in-class.**

Apr. 11 (Wed)  
**Return exam and go over solutions**

*Introduction to Regression Analysis. The Bivariate Model.* What is econometrics? What can we do with it? Deriving the Ordinary Least Squares (OLS) estimators for the bivariate model.

Read: Handout on Regression Analysis (Based on Wooldridge, Introductory Econometrics: A Modern Approach 2E)

Apr. 16 (Mon)  

Apr. 18 (Wed)  
*Interpreting the Bivariate Model.* The meaning of beta and the constant term. Goodness of fit (R²). Hypothesis testing.

Apr. 19 (Thr)  
*Multiple Regression Analysis: Estimation.* Extending the bivariate model to a multivariate analysis.

Apr. 23 (Mon)  
*Multiple Regression Analysis: Estimation, cont’d.*

Apr. 25 (Wed)  
*Multiple Regression Analysis: Inference.*
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<tr>
<td>Apr. 26 (Thr)</td>
<td><em>Multiple Regression Analysis: Inference, cont’d.</em></td>
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<td>Apr. 30 (Mon)</td>
<td>Catch up the schedule</td>
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<tr>
<td>May 2 (Wed)</td>
<td><em>Review for Final Exam.</em></td>
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