

**Matching Course Request**

**Indiana University**

Indianapolis

Campus

Check Appropriate Boxes: Undergraduate credit

Graduate credit

Professional credit

1. School/Division SLA 2. Academic Subject Code Econ

3. Course Number E 571 (must be cleared with University Enrollment Services) 4. Instructor TBD

5. Course Title Econometrics 1 - Statistical Foundations

Recommended Abbreviation (Optional) Econometrics 1-Stat. Foundations  
(Limited to 32 Characters including spaces)

6. First time this course is to be offered (Semester/Year): Fall 2010

7. Credit Hours: Fixed at 3 or Variable from \_\_\_\_\_ to \_\_\_\_\_

8. Is this course to be graded S-F (only)? Yes \_\_\_\_\_ No x

9. Is variable title approval being requested? Yes \_\_\_\_\_ No x

10. Course description (not to exceed 50 words) for Bulletin publication: P: Undergraduate courses in statistics and calculus. The probability bases for statistical estimation and testing are introduced in the context of issues, theories, and data found in economics. The classical linear regression model is presented as the starting point for multivariate analyses in econometrics. Students work with various computer programs in and out of the scheduled class periods.

11. Lecture Contact Hours: Fixed at 3 or Variable from \_\_\_\_\_ to \_\_\_\_\_

12. Non-Lecture Contact Hours: Fixed at \_\_\_\_\_ or Variable from \_\_\_\_\_ to \_\_\_\_\_

13. Estimated enrollment: 5 of which 100 percent are expected to be graduate students.

14. Frequency of scheduling: Annual Will this course be required for majors? Yes

15. Justification for new course: Required for new PhD program in Economics.

16. Are the necessary reading materials currently available in the appropriate library? Yes

17. Please append a complete outline of the proposed course, and indicate instructor (if known), textbooks, and other materials.

18. If this course overlaps with existing courses, please explain with which courses it overlaps and whether this overlap is necessary, desirable, or unimportant

19. A copy of every new course proposal must be submitted to departments, schools, or divisions in which there may be overlap of the new course with existing courses or areas of strong concern, with instructions that they send comments directly to the originating Curriculum Committee. Please append a list of departments, schools, or divisions thus consulted.

Submitted by: [Signature] Date 9-4-09  
Date Department Chairman/Division Director

Approved by: [Signature] Date 12/4/09  
Date

Date \_\_\_\_\_  
Dean of Graduate School (when required)

Date \_\_\_\_\_  
Chancellor/Vice-President

Date \_\_\_\_\_  
University Enrollment Services

After School/Division approval, forward the last copy (without attachments) to University Enrollment Services for initial processing, and the remaining four copies and attachments to the Campus Chancellor or Vice-President.

UPS 724

University Enrollment Services Final-White; Chancellor/Vice-President-Blue; School/Division-Yellow; Department/Division-Pink, University Enrollment Services Advance--White

**Reset**

## E571: ECONOMETRICS I -Statistical Foundations

FALL 2010

Class meets: TBA

Instructor: Jisong Wu, CA526, jjswu@iupui.edu

Economists are interested in economic inference, hypothesis testing, and forecasting. The probability and statistics theory provides a useful tool for achieving this goal. The rationale is that economic phenomena can be viewed as a realization of an underlying stochastic process. The nature and property of a stochastic process is described by its probability law, which can be inferred by appropriate statistical methods in application to the observed data.

E571 is the first of the 4-course econometrics sequence E571, E573, E671, and E673. It introduces basic concepts and theory in probability and statistics, which are useful in E573 and elsewhere (e.g., health, philanthropy/non-profits, and macroeconomics). Throughout the course rigorous quantitative analysis will be emphasized, although economic/financial motivation, intuition and examples will be provided as well. In addition to basic probability and statistics, the students are required to have good command of algebra, especially multivariate differentiation and integration.

The lecture notes covering core material will be distributed in class on a regular basis. They will only contain the essential concepts and the details will be worked out during the classes. The two recommended textbooks listed below provide self-contained presentation of the core material reviewed in class, and go in some aspects beyond the required material.

The books listed below contain numerous examples and exercises. There will be about one homework assignment per week containing analytical questions. It will be mostly from the end-of-chapter exercises of the required textbook. Your homework will be graded by the associate instructor for this course. Please address all questions concerning your homework and homework grades to your graduate assistant during their office hours. The time and place of their office hours will be announced during the first week of semester.

The final grade will be determined by homework (10%), a written closed-book midterm exam (40%) and a written final exam (50%).

**Required Textbook:** Statistical Inference (2001, 2nd Edition), George Casella and Roger L. Berger, Duxbury, ISBN 0534243126

**Optional Text:** Introduction to Mathematical Statistics (2005, Edition 6), Robert V. Hogg, Joseph W. McKean, Allen T. Craig, Pearson/Prentice Hall, ISBN 0130085073

**Homework:** About one problem set per week

**Exams and Grading Policy:** Midterm (40%), Final (50%), Homework (10%)

**Schedule of the Tests:**

Midterm: October 20, M., in class (tentative)

Final: December 17, W., 7:15 p.m. — 9:15 p.m.

Office Hours: TBA

Teaching Assistant: TBA.

## COURSE OUTLINE<sup>1</sup>

### Chapter 1 Introduction to Econometrics

### Chapter 2 Foundation of Probability Theory

- 2.1 Random Experiments
- 2.2 Basic Concepts of Probability
- 2.3 Review of Set Theory
- 2.4 Fundamental Probability Laws
- 2.5 Conditional Probability and Independence

### Chapter 3 Random Variables and Univariate Probability Distributions

- 3.1 Random Variables and Distribution Functions
- 3.2 Discrete Random Variable
- 3.3 Continuous Random Variables
- 3.4 Functions of a Random Variable
- 3.5 Mathematical Expectations
- 3.6 Moment Generating Function
- 3.7 Characteristic Function

### Chapter 4 Important Parametric Distributions

- 4.1 Introduction
- 4.2 Discrete Distributions
- 4.3 Continuous Probability Distributions

### Chapter 5 Random Vectors and Multivariate Probability Distribution

- 5.1 Random vectors and Joint Probability Distributions
- 5.2 Marginal Distributions
- 5.3 Conditional Distributions
- 5.4 Independence
- 5.5 Bivariate Transformation
- 5.6 Expectations Under Multivariate Distributions
- 5.7 Implications of Independence
- 5.8 Conditional Expectations

### Chapter 6 Introduction to Sampling Theory and Statistics

- 6.1 Population and Random Sample
- 6.2 The Sampling Distribution of the Sample Mean
- 6.3 The Sampling Distribution of the Sample Variance
- 6.4 Student's  $t$  Distribution
- 6.5 Snedecor's  $F$  Distribution
- 6.6 Sufficient Statistics

<sup>1</sup> The coverage of the material may vary depending on the pace of the course.

### Chapter 7 Convergence Concepts and Limit Theories

- 7.1 Limits and Orders of Magnitude: A Review
- 7.2 Motivation for Convergence Concepts
- 7.3 Convergence in Quadratic Mean and  $L_p$ -convergence

- 7.4 Convergence in Probability
- 7.5 Almost Sure Convergence
- 7.6 Convergence in Distribution

**Chapter 8 Parameter Estimation and Evaluation**

- 8.1 Population and Distribution Model
- 8.2 Maximum Likelihood Estimation
- 8.3 Method of Moments and Generalized Method of Moments
- 8.4 Mean Squared Error Criterion
- 8.5 Best Unbiased Estimators

**Chapter 9 Hypothesis Testing**

- 9.1 Introduction to Hypothesis Testing
- 9.2 The Wald Test
- 9.3 The Lagrangian Multiplier Test 9.4 The Likelihood Ratio Test
- 9.5 A Simple Example

**Grading Scale**

Letter grade	Percentage
A+	97-100
A	93-96.99
A-	90-92.99
B+	87-89.99
B	83-86.99
B-	80-82.99
C+	77-79.99
C	73-76.99

We are aware that certain items are required for syllabi which are not included in the attached syllabus for the matching course in Bloomington. When the course is taught and the IUPUI syllabus prepared, we will insert the required information as found below.

- Attendance is required. Students who are ill should inform the instructor in advance that they will miss class except in cases of emergency. Absences lasting more than one class should be documented by a physician.
- Late work will be penalized one letter grade.
- Make-up exams will be offered only for illness or emergency documented by a physician or other reliable source.

#### **Americans with Disabilities Act**

If you need any special accommodations due to a disability, please contact Adaptive Educational Services at (317)-274-3241. The office is located in Joseph T. Taylor Hall (UC), Room 137.

#### **Computer Activity**

Students should be advised that, ultimately, you are responsible for activity on your computer accounts. Please be careful to log off public computers whenever the computer will be unattended and do not leave laptops unattended.

#### **Academic Misconduct (from the Code of Student Rights, Responsibilities, and Conduct)**

##### **1. Cheating**

A student must not use or attempt to use unauthorized assistance, materials, information, or study aids in any academic exercise, including, but not limited to, the following:

- A student must not use external assistance on any "in-class" or "take-home" examination, unless the instructor specifically has authorized external assistance. This prohibition includes, but is not limited to, the use of tutors, books, notes, and calculators.
- A student must not use another person as a substitute in the taking of an examination or quiz.
- A student must not steal examinations or other course materials.
- A student must not allow others to conduct research or to prepare work for him or her without advance authorization from the instructor to whom the work is being submitted. Under this prohibition, a student must not make any unauthorized use of materials obtained from commercial term paper companies or from files of papers prepared by other persons.
- A student must not collaborate with other persons on a particular project and submit a copy of a written report which is represented explicitly or implicitly as the student's individual work.
- A student must not use any unauthorized assistance in a laboratory, at a computer terminal, or on field work.
- A student must not submit substantial portions of the same academic work for credit or honors more than once without permission of the instructor to whom the work is being submitted.
- A student must not alter a grade or score in any way.

##### **2. Fabrication**

A student must not falsify or invent any information or data in an academic exercise including, but not limited to, records or reports, laboratory results, and citations to the sources of information.

##### **3. Plagiarism**

A student must not adopt or reproduce ideas, words, or statements of another person without appropriate acknowledgment. A student must give credit to the originality of others and acknowledge an indebtedness whenever he or she does any of the following:

- Quotes another person's actual words, either oral or written;
- Paraphrases another person's words, either oral or written;
- Uses another person's idea, opinion, or theory; or
- Borrows facts, statistics, or other illustrative material, unless the information is common

knowledge.

4. Interference

- a. A student must not steal, change, destroy, or impede another student's work. Impeding another student's work includes, but is not limited to, the theft, defacement, or mutilation of resources so as to deprive others of the information they contain.
- b. A student must not give or offer a bribe, promise favors, or make threats with the intention of affecting a grade or the evaluation of academic performance.

Faculty Action

If I learn that one of my students has committed an act of academic misconduct, I am required to hold an informal conference with the student. The conference should be prompt and private. If I conclude that the student is responsible for the misconduct, then I am authorized to impose an appropriate academic sanction (i.e., lower or failing grade on the assignment, assessing a lower or failing grade for the course).

After reporting the information to the Dean of Students, I will review the information to determine if additional sanctions should be applied.

Sanctions are outlined in the Code of Student Rights, Responsibilities, and Conduct. This document appears on the web at the following address:

<http://life.iupui.edu/rights/docs/CodeofConduct.pdf>

Learning Objectives for Econ 571 - Econometrics I "Statistical Foundations"

1. Be able to use probability theory and random variables to model outcomes that cannot be predicted with certainty.
2. Understand the main distributional types of random variables used in econometric modeling.
3. Be able to use random vectors to model relationships between outcomes that cannot be predicted with certainty.
4. Understand the classical statistical paradigm that a statistic is a random variable that is described by its sampling distribution.
5. Understand convergence concepts in statistics, and their use in the Law of Large Numbers and Central Limit Theorems.
6. Be able to use understanding of probability theory and random vectors to construct new estimators via maximum likelihood and method of moments estimation.
7. Be able to judge the quality of one estimator versus another.
8. Be able to construct confidence intervals and conduct hypothesis tests of population parameters.