

**INDIANA UNIVERSITY PURDUE UNIVERSITY INDIANAPOLIS**  
**School of Public and Environmental Affairs**

**SPEA-K300 Section 4392 (3 Credit)**  
**Statistical Techniques, Fall 2007**  
BS2008 and BS1000 (Lab), MW 12:00-13:15

Instructor: Hun Myoung Park  
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**Prerequisites:** MATH M015 or Equivalent. MATH M118 is recommended.  
**Oncourse CL:** Students should be able to access Oncourse CL (collaboration and learning) at <http://oncourse.iu.edu/portal> Announcements, lecture notes, assignments, and other course materials are provide through Oncourse CL.

## **1. COURSE DESCRIPTION**

This course is designed for undergraduate students who need to understand fundamental concepts in statistics and improve knowledge and skills for empirical data analysis. The topics covered in the class include descriptive statistics, statistical inferences, comparison of group means (t-tests), and analysis of variance (ANOVA), correlation analysis, and the linear regression model (ordinary least squares).

The course emphasizes both theoretical and practical aspects of statistical data analysis. First, students will understand the underlying assumptions and logic of statistical methods. They will then learn which statistical technique is appropriate for answering a research question and how statistical analysis can be misused intentionally or unintentionally.

## **2. LEARNING OUTCOMES**

At the completion of this course, students will be able to:

- understand key concepts and terminology in statistics
- summarize data effectively using numerical and graphical methods
- understand the natures of probability and probability distributions
- construct a hypothesis and test the hypothesis
- compare group means using t-tests and ANOVA
- conduct Chi-square test for categorical variables
- conduct correlation analysis for interval variables
- fit the linear regression model (ordinary least squares)
- interpret the linear regression model substantively
- use statistical software packages (e.g., SPSS) for basic data analysis
- present the results in a professional manner.

Regarding Principles of Undergraduate Learning, students are trained to understand natures of data at hand; determine the appropriate data analysis method; conduct analysis; and interpret and present results effectively (*Core Communication and Quantitative Skills and Critical Thinking*).

### 3. COURSE METHODS

The course is primarily based on a series of lectures and labs. However, students are encouraged to participate in class by asking questions and actively joining discussions. Students may email the instructor or post questions and suggestions on Oncourse CL. Also, students are highly recommended to take advantage of the chance to talk with the instructor during office hours or by making an appointment.

### 4. COURSE REQUIREMENTS

**Attendance and lateness:** Students should attend each class and lab and be present when each class begins. Being 15 minutes late is considered absent from the class. Excused absences for special circumstances (e.g., sickness) may be arranged in advance and will not influence the attendance grade. Each unexcused absence results in one point deduction from the grade.

**Exams:** There will be two in-class, closed book examinations administered during the semester that are NOT equally weighted. Each exam will combine multiple choice, problem solving, and essay questions. Students MUST bring a standard calculator.

**Assignment:** There will be eight homework assignments that are NOT equally weighted. Each assignment includes computation and/or data analysis exercises. Answer keys will be posted on Oncourse CL.

For data analysis, students are encouraged to discuss software use and data preparation with each other when cleaning data, generating new variables, and/or recoding variables. However, you MUST complete your own work (analysis and interpretation) for the final product.

#### **Exam and assignment schedule:**

Exams and Assignment	Assigned	Due
Assignment 1: Basic math	08/27/2007	09/05/2007
Assignment 2: Descriptive statistics	09/10/2007	09/17/2007
Assignment 3: Probability distributions	09/19/2007	09/26/2007
Assignment 4: Statistical inferences	10/01/2007	10/08/2007
Midterm exam		10/17/2007
Assignment 5: Comparing group means (t-test)	10/22/2007	10/29/2007
Assignment 6: Analysis of variance	10/31/2007	11/07/2007
Assignment 7: Estimating linear regressions	11/14/2007	11/26/2007
Assignment 8: Linear regression models	11/28/2007	12/05/2007
Final exam		12/14/2007

**Styles and formats:** Students are expected to follow basic writing principles to answer essay questions. Organize your answer clearly and logically. Hit the highlight and avoid redundancy. Choose correct words (terminology) and expressions especially for interpreting results. Create tables in a professional format.

**Deadline and late penalty:** Assignments should be handed in to the instructor at the start of the class on the due date. Late assignments will be penalized by 10 percent if they are received within 24 hours after the time due and 20 percent if received within 48 hours after the time due. Under no circumstances will late assignments be accepted after two days of the due date without prior authorization from the instructor

**Computer literacy and software:** Students are required to be familiar with general computer software packages such as wordprocessor and spreadsheet programs (e.g., Microsoft Word and Excel). Students should use their university electronic mail accounts to communicate with the instructor and other classmates. SPSS is used for this class, but students may use Stata and SAS as well. Stata, SAS, and SPSS for Windows are available on STC machines in BS3000 and IT131, but only SPSS is available in BS1000. Stata, SAS, and SPSS for UNIX are available on steel and libra clusters, which must be accessed using Secure Shell (SSH). Students may purchase SPSS ELA CDs with one year license for \$35.00 at the bookstore.

## 5. ASSESSMENT AND GRADING

The final grade is based on exams, assignments, class attendance and participation. There weights are

- Eight homework assignments 45%
- Midterm exam 20%
- Final exam 25%
- Class attendance and participation 10%

Grading for this course is as follows:

98 – 100: A+	93 - 97: A	90 - 92: A-
88 - 89: B+	83 - 87: B	80 - 82: B-
78 - 79: C+	73 - 77: C	70 - 72: C-
68 - 69: D+	63 - 67: D	60 - 62: D-
0 - 59: F		

If you object to any grading decisions, you may appeal the grade to the instructor. The appeal must be given along with original assignments or exams to the instructor no later than 24 hours after receiving the grade.

## 6. ACADEMIC DISHONESTY AND MISCONDUCT

Students should not only gain knowledge and skills, but also build their character. **They should complete their own work and be evaluated based upon that work.** Students

should avoid academic dishonesty and misconduct including plagiarism, fabrication (falsification), and collaboration (cheating). All aspects of the Student Code of Conduct (visit <http://www.iupui.edu/code/> for details) and SPEA policies (see SPEA Syllabus Addendum) apply to this class.

Before each class begins, students **MUST** turn off cellular phones, CD/MP3/DMB players, and other electronic devices that may distract the instructor and other students. Laptops are **NOT** allowed for use in class either.

## 7. READING MATERIALS

There is the following **required textbook** that can be purchased at the IU bookstores. Students should bring the textbook to every class. Lecture notes and other materials are available on Oncourse CL. Students should read all required readings listed in the course schedule before the class.

Bluman, Allan G. 2008. *Elementary Statistics: A Step by Step Approach, A Brief Version*, 4<sup>th</sup> ed. New York: McGraw Hill.

Students are also suggested to read the following **optional books** that are reserved at the University Library. Gravetter and Wallnau (2007) are recommended for students in behavioral sciences (e.g., psychology) and Hildebrand, Ott, and Gray (2005) for those who want to study more theoretical and modeling issues.

Gravetter, Frederick J., and Larry B. Wallnau. 2007. *Statistics for the Behavioral Sciences*, 7<sup>th</sup> ed. Belmont, CA: Thompson Wadsworth.

Hildebrand, David K., R. Lyman Ott, and J. Brian Gray. 2005. *Basic Statistical Ideas for Managers*, 2<sup>nd</sup> ed. Belmont, CA: Thomson Brooks/Cole.

If you want to go beyond the tutorials that the instructor provide, see Hamilton (2006), Walker (2002), and Cramer (1997), which provide practical examples of using Stata, SAS, and SPSS, respectively. They are optional.

Cramer, Duncan. 1997. *Fundamental Statistics for Social Research: Step-by-Step Calculations and Computer Techniques Using SPSS for Windows*. New York: Routledge.

Hamilton, Lawrence C. 2006. *Statistics with Stata (Updated for Version 9)*. Belmont, CA: Brooks/Cole-Thomson Learning.

Walker, Glenn A. 2002. *Common Statistical Methods for Clinical Research with SAS Examples*. Cary, NC: SAS Institute.

## 8. COURSE SCHEDULE

\* This schedule is tentative and subject to change. The **Technology Step by Step** in Bluman (2008) may be skipped.

### *1<sup>st</sup> Week:*

August 22 Introduction to the course: probability and statistics  
*Readings: Chapter 1: 1-32*

### *2<sup>nd</sup> Week:*

August 27 Frequency distributions and graphs  
*Readings: Chapter 2: 33-100*  
*<http://www.masil.org/documents/normality.pdf> (section 2)*  
\* *Assignment 1: Basic math (due Wednesday, September 5)*

August 29 Measures of central tendency and variation  
*Readings: Chapter 3: 101-129*  
*<http://www.masil.org/documents/normality.pdf> (section 3)*

### *3<sup>rd</sup> Week:*

September 3 Labor Day Holiday

September 5 Measures of variation and position  
*Readings: Chapter 3: 130-176*  
*<http://www.masil.org/documents/normality.pdf> (section 3)*  
\* *Assignment 1 due*

### *4<sup>th</sup> Week:*

September 10 **Lab (BS1000):** Descriptive statistics  
\* *Assignment 2: descriptive statistics (due Monday, September 17)*

September 12 Probability and counting rules 1  
*Readings: Chapter 4: 177-194*

### *5<sup>th</sup> Week:*

September 17 Probability and counting rules 2  
*Readings: Chapter 4: 195-242*  
\* *Assignment 2 due*

September 19 Discrete probability distributions and the binomial distribution  
*Readings: Chapter 5: 243-279*  
\* *Assignment 3: probability distributions (due Wednesday, September 26)*

### *6<sup>th</sup> Week:*

September 24 Normal distribution and standard normal distribution  
*Readings: Chapter 6: 281-300*

- September 26 Normal Distribution and the central limit theorem  
*Readings: Chapter 6: 303-341*  
<http://www.masil.org/documents/normality.pdf> (section 1)  
 \* Assignment 3 due
- 7<sup>th</sup> Week:**
- October 1 Hypothesis and statistical inferences  
*Readings: Chapter 8: 387-400, lecture note*  
<http://www.masil.org/documents/power.pdf> (Section 1-3)  
 \* *Assignment 4: Statistical inferences (due Monday, October 8)*
- October 3 Point and interval estimation of means  
*Readings: Chapter 7: 343-363, Chapter 8: 401-423*
- 8<sup>th</sup> Week:**
- October 8 Point and interval estimation of proportions and variances  
*Readings: Chapter 7: 365-385, Chapter 8: 425-455*  
 \* Assignment 4 due
- October 10 Assumptions of t-tests and the paired t-test  
*Readings: Chapter 9: 491-501*  
<http://www.masil.org/documents/ttest.pdf> (section 1-3)
- 9<sup>th</sup> Week:**
- October 15 **Lab (BS1000):** probability distribution and hypothesis test  
 Review session
- October 17 Midterm exam
- 10<sup>th</sup> Week:**
- October 22 Comparing two independent sample means  
*Readings: Chapter 9: 457-488*  
<http://www.masil.org/documents/ttest.pdf> (section 4-5)  
 \* *Assignment 5: t-tests (Due Monday, October 29)*
- October 24 Comparing two proportions  
*Readings: Chapter 9: 503-520*  
<http://www.masil.org/documents/ttest.pdf> (section 7)
- 11<sup>th</sup> Week:**
- October 29 Analysis of variance (ANOVA)  
*Readings: Chapter 11: 592-612*  
 \* Assignment 5 due
- October 31 **Lab (BS1000):** t-test and ANOVA  
*Readings: <http://www.masil.org/documents/ttest.pdf> (section 6)*

\* *Assignment 6: analysis of variance (due Wednesday, November 7)*

**12<sup>th</sup> Week:**

November 5 Chi-square test and measures of association  
*Readings: Chapter 11: 563-589, lecture note*

November 7 Correlation analysis and linear regression model  
*Readings: Chapter 10: 521-535*  
*\* Assignment 6 due*

**13<sup>th</sup> Week:**

November 12 Simple linear regression model  
*Readings: Chapter 10: 535-561*

November 14 Goodness of fit and hypothesis test  
*Readings: Chapter 10: 535-561*  
*\* Assignment 7: estimating linear regressions (due Monday, Nov. 26)*

**14<sup>th</sup> Week:**

November 19 **Lab (BS1000):** linear regression and hypothesis test

November 21 Thanksgiving break

**15<sup>th</sup> Week:**

November 26 Multiple linear regressions  
*Readings: Hildebrand, Ott, and Gray (2005): 567-588*  
*\* Assignment 7 due*

November 28 Using dummy independent variables  
*Reading: Lecture note.*  
*<http://www.masil.org/documents/panel.pdf> (section 1-2)*  
*\* Assignment 8: linear regression models (due Wednesday, December 5)*

**16<sup>th</sup> Week:**

December 3 **Lab (BS1000):** least squares dummy variable (LSDV)

December 5 Properties of linear regression models  
*\* Assignment 8 due*

**17<sup>th</sup> Week:**

December 10 Review session

December 12 No class

December 14 (**Friday**) **Final exam (10:30-12:30)**