

LAMP-316: Analytical Problem Solving
Spring 2012
Course # 20054

Class: Tues/Thurs 2:30-3: 45pm, 119 Woodburn Hall
Labs: Friday 2:30-3:45pm, 221 Student Building

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Course Description

This course will serve as an introduction to statistical concepts and reasoning, emphasizing the use of statistics in real-world problem solving. An understanding of statistics is more important now than ever as the analysis of quantitative data is becoming increasingly commonplace in many work environments and as we are increasingly bombarded with statistics in the media. This course will cover statistical techniques involving both inferential and descriptive statistics, building skills that will allow us to become both competent data analysts and intelligent consumers of the statistics we are confronted with in everyday life. No prior knowledge of statistics is assumed, but students should have a solid understanding of basic algebra.

Unlike many statistics classes, we will not just be learning statistics from a textbook; rather, we will work as a group and in teams to produce a report for a client organization in the IU community: the IU Office of Sustainability. We will be analyzing data collected last semester for this client to aid the development and implementation of more effective programs for engaging the IU student body in issues of sustainability. Though our client understands that this is a student project, representing work from only one of several courses being taken during the semester, they also have high expectations about the work you will produce and are legitimately looking for help in solving their problems.

Required Material

Readings:

There is a recommended (though not required) text for this course:
Miethe, Terance D. and Jane Florence Gauthier. *Simple Statistics: Applications in Social Research*. Oxford University Press.

Additionally, you may find the following free online resource helpful:

Online Statistics: An Interactive Multimedia Course of Study, by David Lane, Joan Lu, Camille Peres and Emily Zitek. <http://onlinestatbook.com/>

Other readings will be available on the class OnCourse website.

Calculator:

You will need a basic scientific calculator. Anything that has the square root ($\sqrt{\quad}$) and square (x^2) functions should be fine. You do not need a graphing calculator.

Software:

The labs in the course will make use of a statistical software package called Stata. This software is available in computer labs on campus and I do **NOT** recommend purchasing it.

Course Requirements

Problem Sets:

Problem sets will be uploaded to the class OnCourse site regularly. These are not graded but are extremely valuable for learning the material. You will get the most out of the problem sets if you do them soon after you get them (don't let them pile up) and if you can resist the temptation to look at the answer key before working the problems.

In Class Assignments/Quizzes:

There will typically be an in-class assignment (or quiz, if you prefer to think of it this way) every two weeks, starting Thursday, Jan 19. Each is worth 50 points and there will be six total throughout the semester. You will have the entire class period to work on each quiz.

Assignment/Quiz dates: Jan 19, Feb 2, Feb 16, March 1, March 22, April 5.

Labs:

In addition to the Tuesday-Thursday lectures, you will also participate in lab sessions on Friday afternoons in which you will have the chance to analyze data using SPSS and engage in other problem solving exercises. The lab sessions should help you master the class material by allowing you to get hands on experience working with data and to improve your skills in statistical computation. Some of the labs will involve working with the data we have collected for our client organization. It is of the utmost importance that you arrive to your lab session on time and well-prepared.

There will be a total of five graded lab assignments over the course of the semester, with one usually being due approximately every other week starting on Jan 19. Each lab assignment will be passed out during the lab session and will be due either at the end of the lab session or the beginning of class on Monday, depending on the length. You are permitted (and encouraged!) to work on these assignments in pairs or small groups, however you must turn in your own work. Each lab is worth 50 points and you will be allowed to drop your lowest lab score of the semester.

During some of the weeks that we do not have labs, the undergraduate assistant will host tutorial sessions during the lab period. These are optional lab sessions that you may attend to receive individualized help on the course material from the undergraduate assistant. Additionally, on some non-lab Fridays we may engage in activities with the client data.

Group Presentation:

Students will participate in a group presentation (the groups will be the same as your final project groups). Each group will be assigned one section of Darrell Huff's *How to Lie With Statistics* or Joel Best's *Stat Spotting* (both texts will be available on the class OnCourse website). You will be responsible for briefly explaining your section to the class as well as providing and explaining an example from the media relevant to your section. Groups, topics and presentation dates will be discussed and determined in class.

Participation:

A large part of this course is focused on applying what we learn about survey research and statistics in our research project on behalf of the IU Office of Sustainability. As such, students are expected to come to class ready to discuss the material (including any assigned readings), to contribute to class discussions about the course materials and the project, and to participate fully in class exercises.

Attendance:

I expect you to be present at all class meetings and required labs and to be on time. On the rare occasion that you may be required to miss class, you are responsible for obtaining materials covered in class and lab, as well as any special announcements made in class about changes to the course schedule/policies. I will not take attendance. That said, given the nature of the material and the semester-long applied research project, poor attendance will make it very difficult for you to do well in the course and for your group to contribute to the community project.

Community Based Applied Research Project:

The central focus of much of this course will be the applied research projects we conduct for the IU Office of Sustainability. The purpose of this project is to apply the skills we develop throughout this course to the problems faced by a real organization. This project will be a class effort and students will work in groups of 4 (there may be one or two groups of different sizes if necessary) to address a specific aspect of the overall project. Students are expected to be active participants in their groups and will occasionally be asked to report on their progress to the rest of the class.

Grading

Your final grade for the class will be based on the number of points you earn as a percentage of the total possible number of points. The number of points possible on each of the assignments and quizzes is shown below:

<u>Component</u>	<u>Points Each</u>	<u>Total Points</u>
Quizzes (6)	50	300
Community Project	200	200
Lab Assignments (4/5)	50	200
Short Group Presentation	50	50
Participation	50	50
Total		800

Letter grades will be assigned as follows:

A+	100-97%	(800-776)	C	76-73%	(615-584)
A	96-93%	(775-744)	C-	72-70%	(583-560)
A-	92-90%	(743-720)	D+	69-67%	(559-536)
B+	89-87%	(719-696)	D	66-63%	(535-504)
B	86-83%	(695-664)	D-	62-60%	(503-480)
B-	82-80%	(663-640)	F	60-60%	(<479)
C+	79-77%	(639-616)			

Guidelines and Policies

Incompletes:

In accordance with departmental and university policies, I will not grant an incomplete except in cases of unusual or extreme circumstances.

Make up Quizzes/Assignments

Make-up quizzes typically will not be given. The only exception to this policy is when the situation involves extreme and unusual circumstances. You must also provide documentation of these circumstances. If you cannot take the quiz for some reason, you must contact me prior to the quiz. With my permission, you may take the quiz at a later date. Failure to get my permission will mean that you will not be able to take a make-up quiz. If there is an emergency on the day of the quiz, email me before the quiz is given and provide me with documentation of the emergency.

Academic Misconduct:

Academic dishonesty (such as cheating or plagiarism) will not be tolerated and will be dealt with according to university policy. Please see the Code of Student Rights, Responsibilities and Conduct for university policies on academic misconduct and academic dishonesty. (<http://www.dsa.indiana.edu/code/index.html>).

Special Needs

In compliance with the Americans with Disabilities Act (ADA), IU seeks to provide “reasonable accommodation” for qualified individuals with documented disabilities. It is the student’s responsibility to inform me and to contact the Disability Student Service Office (855-7579; <http://www.dsa.indiana.edu/dss.html>) about any special learning/study needs relating to a documented disability.

Outline of Topics Covered in Class

Below is an outline of the topics to be covered during the course in the approximate order we will cover them. I have also listed readings from the recommended text that correspond to each topic.

Topic	Associated Readings
1. Introduction	Pgs. 1-13, 37-41
2. Univariate Descriptive Statistics	
a. Frequency Distributions	Pgs. 47-58
b. Central tendency of a distribution	Pgs. 73-87
c. Dispersion/variability of a distribution	Pgs. 94-99
3. Bivariate Descriptive Statistics	
A. Two qualitative variables: Contingency tables and related measures of association	188-201 (don’t worry about the discussion of degrees of freedom or significance; we will get to this later).
B. Comparing groups: A qualitative independent and quantitative dependent variable	OnCourse
C. Two quantitative variables: Regression and correlation	Pgs. 235-248
D. Introduction to multivariate analysis	Pgs. 261-263
4. Inferential Statistics	
A. Probability and random variable distributions	OnCourse & pgs. 115-118
B. Sampling distributions	Pgs, 128-130 & OnCourse
C. Normal and standard normal distributions	Pgs. 105-115
D. Estimation	Pgs. 127-143
(1) Confidence interval for a mean	Pgs. 133-136, 140-142
(2) Confidence interval for a proportion	Pgs. 137-138, 142-143
E. Hypothesis testing	
(1) Logic of hypothesis testing	Pgs. 149-160
(2) Hypothesis test about a single mean	Pgs. 167-170
5. Hypothesis testing in	

multivariate analysis	
A. Comparing groups: Difference of means test and its extensions	Pgs. 173-175, 178-181
B. Contingency tables revisited	Pgs. 188-202
C. Regression and correlation revisited	
(1) Simple regression	Pgs. 248-251
(2) Multiple regression	Pgs. 266-271
D. Extensions and additional statistical tests, as needed for your projects (e.g., logistic regression, measures of association for ordinal variables, etc.)	

Tentative Lab Schedule:

Jan 13	Introduction to Stata
Jan 20	Tutorial #1
Jan 27	Lab Assignment #1
Feb 3	Tutorial #2
Feb 10	Lab Assignment #2
Feb 17	Tutorial #3
Feb 24	Lab Assignment #3
March 2	Tutorial #4
March 9	Lab Assignment #4 (Attendance Optional)
March 23	Tutorial #5
March 30	Lab Assignment #5
April 6	Work on Final Projects
April 13	Work on Final Projects
April 20	Work on Final Projects
April 27	Work on Final Projects