

## Rationale for Data Analysis 205

### Meeting Course Objectives

1. Statistics is about collecting and evaluating data in order to draw conclusions. To help students understand these fundamental concepts, several data gathering exercises will be performed in class and the collected data will be statistically analyzed into meaningful information and presented as part of class discussions.
2. Several examples will be highlighted from the textbook as well as from the popular press on the proper and improper use of data in graphical and numerical arguments. For example, graphical arguments can be under- or over-stated by simply changing the scales of measurement. Numerical arguments in statistics are often flawed because they are based on data that are nonrandom. Students in this course will be exposed to the proper use of data for both graphical and numerical arguments. Relevant concepts that are used to help emphasize graphical and numerical arguments include frequency distributions, pie charts, bar graphs, means, variances, standard deviations, skewness, random samples and nonrandom samples.
3. Some of the most popular statistical concepts covered in the course include descriptive statistics, basic probabilities, sampling, sampling distributions, interval estimation, hypothesis testing, and regression analysis. All of these concepts are carefully discussed to make sure students comprehend the appropriate and inappropriate uses of them. For example, a descriptive statistic such as a mean can be very misleading if an outlier is dominant in the data set. For such a data set, the mean and median would be compared to help students see the advantage of the median over the mean. Similarly, with respect to sampling, many examples are used to illustrate the statistical advantages of random samples over nonrandom samples. Of course, the proper use of nonrandom sampling is also emphasized. Indeed, for each of the listed concepts, students are provided many illustrations on the appropriate and inappropriate uses of them.
4. To help students understand the concept of probability, the following topics are covered: experiments, sample space, counting rules, events, conditional probabilities, unconditional probabilities, joint probabilities, and Bayes' theorem. To make these concepts practical, in-class exercises, such as having students guess the probability that at least two individuals within the class are born on the same date (month and day), are conducted. Students always underestimate this probability and it becomes a teaching moment to reveal at least one pair of matching birthdays.
5. To help students gain practical experience with analyzing data, a 48-minute, weekly computer lab is a required part of the class. A Teaching Assistant for the class prepares a weekly lab over the topics covered in lectures. For example, if the topic of descriptive statistics is covered in the weekly lectures, the corresponding lab would cover the derivation of quantitative measures

such as means, modes, variances, percentiles, quartiles, standard deviations, and coefficient of variations.

6. Data Analysis 205 is not a calculus-based course, requiring only Math 130 as a prerequisite.
7. Data Analysis 205 is taught within the Department of Agricultural, Environmental and Development Economics, but the concepts taught are applicable to any major in the university. Indeed examples are used from a wide array of fields, ranging from medicine to agriculture. To help emphasize the broad appeal of the course, we stress a quote from an old Forrest Gump movie in which he says that: "Life is like a box of Chocolates" in that "You never know what you are going to get." What we try to emphasize is that, after taking Data Analysis 205, "You can at least estimate what you are going to get." And this power to estimate what one is going to get out of life is relevant and important to everyone, not just those in a specific major.