

AP[®] Statistics: Syllabus 2

Syllabus 1058810v1



Scoring Components	Page(s)
SC1 The course provides instruction in exploring data.	3
SC2 The course provides instruction in sampling.	2
SC3 The course provides instruction in experimentation.	2
SC4 The course provides instruction in anticipating patterns.	4
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SC6 The course draws connections between all aspects of the statistical process including design, analysis, and conclusions.	7
SC7 The course teaches students how to communicate methods, results and interpretations using the vocabulary of statistics.	7
SC8 The course teaches students how to use graphing calculators to enhance the development of statistical understanding through exploring data, assessing models, and/or analyzing data.	3–6
SC9 The course teaches students how to use graphing calculators, tables, or computer software to enhance the development of statistical understanding through performing simulations.	4
SC10 The course demonstrates the use of computers and/or computer output to enhance the development of statistical understanding through exploring data, analyzing data, and/or assessing models.	3, 5–6

Primary Textbook

Peck, Roxy, Chris Olsen, and Jay Devore. *Introduction to Statistics and Data Analysis*, 4th ed. Belmont, CA: Thompson Brooks/Cole, 2010.

Technology

- All students have a TI-83/TI-83+/TI-84 graphing calculator for use in class, at home, and on the AP Exam. Students will use their graphing calculators extensively throughout the course.
- All students have a copy of JMP-Intro statistical software for use at home and for demonstrations in class. Students will have occasional assignments that must be completed using JMP-Intro. After the AP Exam, students will use JMP-Intro daily, when we learn multiple regression and ANOVA.
- Various applets on the Internet

Course Outline

(organized by chapters in primary textbook):

Graphical displays include, but are not limited to, using boxplots, dotplots, stemplots, back-to-back stemplots, histograms, frequency plots, parallel boxplots, and bar charts.

Chapter 1: The Role of Statistics and the Data Analysis Process (total time: 1 day)

- Activity: Sexual Discrimination

Chapter 2: Collecting Data Sensibly (total time: 14 days) [SC2 & SC3]

- Types of data
- Observational studies
- Activity: Sampling from the Gettysburg Address
- Bias in sampling
- Simple random samples
- Stratified random samples
- Activity: The River Problem
- Cluster sampling
- Designing experiments
- Control groups
- Treatments
- Blocking
- Random assignment
- Replication
- Activity: The Caffeine Experiment
- The scope of inference

SC2—The course provides instruction in sampling.

SC3—The course provides instruction in experimentation.

Chapter 3: Graphical Methods for Describing Data (total time: 4 days)

- Displaying categorical data: pie and bar charts
- Dotplots
- Stemplots
- Histograms
- Describing the shape of a distribution
- Cumulative frequency graphs

Chapter 4: Numerical Methods for Describing Data (total time: 8 days) [SC1 & SC8]

- Describing center: mean and median
- Describing spread: range, interquartile range, and standard deviation
- Boxplots
- Outliers
- Using the TI-83
- The empirical rule
- Standardized scores
- Percentiles and quartiles
- Transforming data
- Using JMP-Intro
- Activity: Matching Distributions

SC1—The course provides instruction in exploring data.

SC8—The course teaches students how to use graphing calculators to enhance the development of statistical understanding through exploring data, assessing models, and/or analyzing data.

Chapter 5: Summarizing Bivariate Data (total time: 16 days) [SC10]

- Introduction to bivariate data
- Making and describing scatterplots
- The correlation coefficient
- Properties of the correlation coefficient
- Least squares regression line
- Using the TI-83
- Regression to the mean
- Residual plots
- Standard deviation
- Coefficient of determination
- Unusual and influential points
- Activity: Matching Scatterplots and Correlations
- Applets: demonstrating the effects of outliers
- Using JMP-Intro
- Modeling nonlinear data: exponential and power transformations

SC10—The course demonstrates the use of computers and/or computer output to enhance the development of statistical understanding through exploring data, analyzing data, and/or assessing models.

Midterm: Chapters 1–5 (total time: 3 days)

- Review chapters 1–5 using previous AP questions
- Introduce first semester project

Chapter 6: Probability (total time: 13 days) [SC4 & SC9]

- Definition of probability, outcomes, and events
- Law of large numbers
- Properties of probabilities
- Conditional probability
- Independence
- Addition rule
- Multiplication rule
- Estimating probabilities using simulation
- Using the TI-83 for simulations
- Activity: Cereal Boxes
- Activity: ESP Testing
- Activity: Senior Parking

SC4—The course provides instruction in anticipating patterns.

SC9—The course teaches students how to use graphing calculators, tables, or computer software to enhance the development of statistical understanding through performing simulations.

Chapter 7: Random Variables and Probability Distributions (total time: 18 days) [SC4 & SC8]

- Properties of discrete random variables
- Properties of continuous random variables
- Expected value (mean) of a discrete random variable
- Standard deviation of a discrete random variable
- Linear functions and linear combinations of random variables
- The binomial distribution
- The geometric distribution
- The normal distribution
- Using the normal table
- Using the TI-83 distribution menu
- Combining normal random variables
- Normal approximation to the binomial

SC8—The course teaches students how to use graphing calculators to enhance the development of statistical understanding through exploring data, assessing models, and/or analyzing data.

First Semester Final Exam (total time: 4 days)

- Review using previous AP questions

Chapter 8: Sampling Variability and Sampling Distribution (total time: 9 days)

- Sampling distributions
- Activity: How Many Textbooks?
- Activity: Cents and the Central Limit Theorem

- Sampling distribution of the sample mean (including distribution of a difference between two independent sample means)
- Sampling distribution of the sample proportion (including distribution of a difference between two independent sample proportions)

Chapter 9: Estimation Using a Single Sample (total time: 10 days)

- Properties of point estimates: bias and variability
- Confidence interval for a population proportion
- Confidence interval for a population mean
- Logic of confidence intervals
- Meaning of confidence level
- Activity: What Does It Mean to Be 95 Percent Confident?
- Finding sample size
- Finite population correction factor
- +4 confidence interval for a proportion
- Confidence interval for a population mean
- The t-distribution
- Checking conditions

Chapter 10: Hypothesis Testing Using a Single Sample (total time: 11 days) [SC10]

- Forming hypotheses
- Logic of hypothesis testing
- Type I and Type II errors
- Hypothesis test for a population proportion
- Test statistics and p-values
- Activity: Kissing the Right Way
- Two-sided tests
- Hypothesis test for a population mean
- Checking conditions
- Power
- Using JMP-Intro

SC10—The course demonstrates the use of computers and/or computer output to enhance the development of statistical understanding through exploring data, analyzing data, and/or assessing models.

Chapter 11: Comparing Two Populations or Treatments (total time: 11 days) [SC5 & SC8]

- Activity: Fish Oil
- Hypothesis test for the difference of two means (unpaired)
- Two-sided tests
- Checking conditions
- Confidence interval for the difference of two means (unpaired)
- Matched pairs hypothesis test

SC5—The course provides instruction in statistical inference.

SC8—The course teaches students how to use graphing calculators to enhance the development of statistical understanding through exploring data, assessing models, and/or analyzing data.

- Matched pairs confidence interval
- Hypothesis test for the difference of two proportions
- Confidence interval for the difference of two proportions
- Using the TI-83 test menu
- Choosing the correct test: it's all about the design

Midterm (chapters 8–11) (total time: 3 days)

- Review using previous AP questions

Chapter 12: The Analysis of Categorical Data and Goodness-of-Fit Tests (total time: 8 days) [SC5 & SC8]

- Activity: M&M's
- The chi-square distribution
- Goodness-of-fit test
- Checking conditions
- Assessing normality
- Homogeneity of proportions test (including large sample test for a proportion)
- Using the TI-83
- Test of independence
- Choosing the correct test: it's all about the design

SC5—The course provides instruction in statistical inference.

SC8—The course teaches students how to use graphing calculators to enhance the development of statistical understanding through exploring data, assessing models, and/or analyzing data.

Chapter 13: Simple and Linear Regression and Correlation: Inferential Methods (total time: 5 days) [SC5, SC8 & SC10]

- Activity: Dairy and Mucus
- Hypothesis test for the slope of a least squares regression line
- Confidence interval for the slope of a least squares regression line
- Using the TI-83
- Using JMP-Intro
- Understanding computer output

SC10—The course demonstrates the use of computers and/or computer output to enhance the development of statistical understanding through exploring data, analyzing data, and/or assessing models.

Review for AP Exam and Final Exam (total time: 7 days)

- 2007 complete AP Exam
- Remaining previous AP questions
- Final exam
- AP Exam

Post-AP Exam (total time: 25 days)

- Second semester project (see below)
- Chapter 14: Multiple Regression
- Using JMP-Intro

- Chapter 15: ANOVA
- Using JMP-Intro
- Guest speakers: careers in statistics

AP Statistics Example Project [SC5, SC6 & SC7]

The Project: Students will design and conduct an experiment to investigate the effects of response bias in surveys. They may choose the topic for their surveys, but they must design their experiment so that it can answer at least one of the following questions:

- Can the wording of a question create response bias?
- Do the characteristics of the interviewer create response bias?
- Does anonymity change the responses to sensitive questions?
- Does manipulating the answer choices change the response?

Develop a hypothesis that will enable the question you choose to study to be answered. For example, you might choose the second question and have two different interviewers (good-cop / bad-cop style) conduct the survey.

The project will be done in pairs. Students will turn in one project per pair. A written report must be typed (single-spaced, 12-point font), and included graphs should be done on the computer using JMP-Intro or Excel.

Proposal: The proposal should

- describe the topic and state which type of bias is being investigated;
- describe how to obtain subjects (minimum sample size is 50); and
- describe what questions will be used and how they will be asked, including how to incorporate direct control, blocking, and randomization.

Written Report: The written report should include a title in the form of a question and the following sections (clearly labeled):

- **Introduction:** What form of response bias was investigated? Why was the topic chosen for the survey?
- **Methodology:** Describe how the experiment was conducted and justify why the design was effective. Note: This section should be very similar to the proposal.
- **Results:** Present the data in both tables and graphs in such a way that conclusions can be easily made. Make sure to label the graphs/tables clearly and consistently. Perform a hypothesis test on the data gathered and report conclusions based on statistical inference.
- **Conclusions:** What conclusions can be drawn from the experiment? Be specific. Were any problems encountered during the project? What could be done differently if the experiment were to be repeated? What was learned from this project?
- The original proposal.

SC5—The course provides instruction in statistical inference.

SC6—The course draws connections between all aspects of the statistical process including design, analysis, and conclusions.

SC7—The course teaches students how to communicate methods, results and interpretations using the vocabulary of statistics.

Poster: The poster should completely summarize the project yet be simple enough to be understood by any reader. Students should include some pictures of the data collection in progress.

Oral Presentation: Both members will participate equally. The poster should be used as a visual aid. Students should be prepared for questions.