AP® Statistics: Syllabus 1

Syllabus 1058793v1

Scoring Components		Page(s)
SC1	The course provides instruction in exploring data.	4
SC2	The course provides instruction in sampling.	5
SC3	The course provides instruction in experimentation.	5
SC4	The course provides instruction in anticipating patterns.	6–7
SC5	The course provides instruction in statistical inference.	7
SC6	The course draws connections between all aspects of the statistical process including design, analysis, and conclusions.	2
SC7	The course teaches students how to communicate methods, results and interpretations using the vocabulary of statistics.	8
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.	5–6
SC9	The course teaches students how to use graphing calculators, tables, or computer software to enhance the development of statistical understanding through performing simulations.	6
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.	2, 4–5, 7–8

Overview of AP Statistics

Course Design

One of the greatest differences between teaching statistics and teaching most other mathematics courses is the ease with which a teacher may vary instruction and activities. In the AP Statistics classes, students sit at tables that are pushed together to form clusters containing four to six students. Fostering important classroom discussion pertaining to topics such as methodology and inferences is supported by students working together in small groups.

Teaching materials for the course come from textbooks, classroom lectures, newspapers, journals, medical newsletters, videos, and the World Wide Web. At the start of the school year, students receive a list of formulas and tables from the course description book. These handouts are used throughout the year for homework and tests. Students also have access to a classroom set of TI-83 calculators. Students who do not own a calculator use the ones provided by the school for classwork and then check them out after school for home use. Approximately twice a semester, students float into the Computer Math Lab to complete statistics computer assignments. There is one demonstration computer available for use in the classroom. MINITAB statistical software (Minitab) is the software package used for the computer labs. **[SC10]**

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.

Projects

Projects are also a major part of the course. Students complete three to five projects each semester. Some of these projects are completed during class time, whereas others are completed outside of class. The library has computers for student use that have Minitab installed. These projects require students to design surveys and experiments, gather data, analyze the data numerically and graphically, and apply inferential statistics to draw conclusions for a population. Students write formal reports on their projects using statistical language. **[SC6]**

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

Remarks

The single thing that stands out in my mind about teaching statistics is how the unexpected always happens. Nothing is predictable in the statistics classroom. I have become more flexible in the classroom and more comfortable with not knowing the answers to all of the questions posed by students. I find networking with other teachers or professors and exchanging materials with other teachers the most helpful resource there is. I work harder as a teacher than I have ever worked before, but I find the rewards of this extra work worth the effort.

Primary Textbook, References, and Resource Materials

(Noted with the following letters in the Course Outline)

T = Moore, David S., Bruce Craig, and George P. McCabe. *Introduction to the Practice of Statistics*, 4th ed. New York: W. H. Freeman, 2002.

V = *Against All Odds: Inside Statistics*. Developed by David S. Moore. Washington, D.C.: The Annenberg/CPB Collection, 1989. 26 videocassettes. Available at http://www.learner.org/resources/series65.html.

C = The North Carolina School of Science and Mathematics, Department of Mathematics and Computer Science. *Contemporary Precalculus through Application*, 2nd ed. Chicago: Everyday Learning, 2000.

POD = Peck, Roxy, Chris Olsen, and Jay Devore. *Introduction to Statistics and Data Analysis*, 2nd ed. Pacific Grove, Calif.: Duxbury, 2004.

WK = Rossman, Allan J., and Beth Chance. *Workshop Statistics: Discovery with Data*, 2nd ed. New York: Key College, 2000.

TI = Texas Instruments TI-83 Plus graphing calculator.

O = Other resource materials used in the classroom come from articles in newspapers, journals, and the World Wide Web. Students often bring in data sets they collect or download from the Web.

W = Worksheets for reinforcement, introduction of concepts, or review.

HW = Homework problems assigned from the Moore and McCabe textbook. Some of the problems listed are worked in class as discussion problems.

Course Outline and Content

Fall Semester

Week Content	Text and Resource	Materials
Week 1 Introduction to Statistics.	Introduction to Statistics. Students read about experimental design, ethics in medical testing and experiments, and the role of statistics in medicine and society. Essay: "The Biggest Public Health Experiment Ever: The 1954 Field Trial of the Salk Poliomyelitis Vaccine." Quiz. Polio article and assigned readings.	Readings from the *Harvard Women's Newsletter* and the newspaper PBS Video: *Paralyzing Fear: The Story of Polio in America*

Week Content	Text and Resource	Materials
Weeks 2–3 HW Chapter 1 1, 3, 6, 8, 10, 14, 16, 18, 21, 24, 25, 27, 30, 31, 41, 43, 44, 58, 64, 62, 68	Exploring Data. **[SC1]** Graphical displays of distributions of univariate data: boxplots, stemplots, dotplots, histograms, frequency charts, cumulative frequency charts, and bar charts. Stress center, spread, and shape. Summarizing distributions of univariate data. Mean, median, mode, range, interquartile range, quartiles, standard deviation, percentiles, standardized scores (*z*-scores). Comparing distributions of univariate data. Compare center, spread, clusters, gaps, outliers, and shapes within groups and between dotplots, stemplots, and boxplots. Approximately two days are spent in instruction with the TI-83 calculator. Students use data generated in the class for classroom exercises. Activity: Class data-collecting activity of student-made rockets and "Tootsie Pops": How long to the center? Write-ups of the activities are due the end of week 4. Quiz.	T pages 1–64 WK Worksheet on cumulative frequency charts and matching graphs to data: pages 27–34 W Practice AP problem; 1997 test, Q-1
Weeks 4–5 HW Chapter 1 72, 73, 75, 77, 79, 81, 83, 85, 87, 88, 89, 95, 97–100, 104, 110, 112, 113, 114	Standard Deviation and Variance. Properties of standard deviation and the effects of changing measurements and linear transformations on summary measures. The normal distribution and Chebyshev's theorem. Measuring position, quartiles, percentiles, standardized scores (*z*-scores). Using the normal distribution as a model for measurement. Normal quartile plots. Students spend two days in the computer lab standardizing data, graphing normal quartile plots, and interpreting information from the graphical and numerical displays of data. **[SC10]** Video: *Normal Distributions and Normal Calculations*. Test.	T Pages 64–97 V 4, 5
Week 6 HW Chapter 2 1, 3, 5, 7, 5, 20, 24, 26, 30	Scatterplots and Correlation. Explanatory and response variables, analyzing patterns in scatterplots, time series, correlation, and linearity. Activity: *Matching Descriptions to Scatterplots*. Computer Lab: Use the Internet to browse websites for Java applets on LSRL, correlation, and scatterplots.	T pages 104–135

SC1—The course provides instruction in exploring data.

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.

Week Content	Text and Resource	Materials
Weeks 7–9 HW Chapter 2 35, 39, 41, 47, 9, 51, 55, 59, 63, 75, 77	Bivariate Data. Least squares regression line, residual plots, outliers, influential points, and transformations to achieve linearity. Approximately two days are spent in instruction with the TI-83 calculator. Two days are spent in the classroom for a data collection and curve-fitting lab. Pairs of students work together to generate three sets of bivariate data. Students use calculators and computers to write equations of the curves that best model their data. **[SC8 & SC10]** Project: A data collection project is due at the end of the 9th week. Videos: *Models for Growth, Describing Relationships, Correlation*. Test.	T pages 135–193 C pages 235–263 W Curve-fitting problems V 7, 8, 9
Weeks 10–12 HW Chapter 2 81–85, 87, 91, 92, 96, 98, 100, 102, 104, 106	Relations in Categorical Data. Analyzing two-way tables, Simpson's paradox, conditional relative frequencies, and association. The concept of cause and effect, anecdotal evidence, observational studies, and experiments. Video: *The Question of Causation*. Two-day Minitab lab on calculating the least squares regression line, dotplots, boxplots, and scatterplots. Students explore the effect of outliers and influential points. **[SC10]** (Data from "Old Faithful" geyser in Yellowstone Park.) Lab due at the end of week 11. Test.	T pages 193–214 V 11
Weeks 13–14 HW Chapter 3 1–8, 9–14, 17, 18, 20, 21, 23, 27, 31, 33, 34, 35, 39, 41, 43, 44, 45	Experimental Design, Sampling, and Randomness. **[SC2 & SC3]** Different methods of data collection, simple random sampling, sampling error, bias, stratifying, confounding, blocking, and replication. Two days are spent on class activities to develop an understanding of randomness and sampling. "Random Rectangles." Videos: *Experimental Design, Blocking and Sampling*. A project on writing a questionnaire and conducting a survey is due at the end of the 14th week. Test.	T pages 230–284 V 12, 13 W Practice AP problems: 1999, Q-3; 2000, Q-5

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.

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.

SC2—The course provides instruction in sampling.

SC3—The course provides instruction in experimentation.

Week Content	Text and Resource	Materials
Week 15 HW Chapter 4 12, 13, 15, 17, 21–25, 30, 36	Probability. Basic probability rules. **[SC4 & SC9]** Simulations as a means to answer probability questions. Two days are spent on class activities to develop ideas of probabilities and estimates of proportions. "Spinning Pennies" and "Estimating Proportions: How Accurate Are the Polls?" Quiz.	T pages 291–312 W Practice AP problems: 1999, Q-5, work by simulation; 2001, Q-3
Weeks 16–17 HW Chapter 4 39, 40, 42, 44, 46, 48, 51, 52, 55, 56, 59, 61, 65, 69, 75, 77, 78, 80, 82, 83, 91, 92, 96	Random Variables and Sampling Distributions. **[SC4 & SC9]** Simulation of probability distributions and sampling distributions. Expected values and standard deviation of a random variable. Mean and standard deviation for sums and differences of independent random variables. One day is spent in class using the TI-83 to develop rules for the mean and variance of independent random variables and probability distributions. **[SC8]** Video: *Samples and Surveys*. Activity: A lottery is run every day for one week. The Texas lottery model is used, and prizes are awarded. Test.	T pages 312–370 W Practice probability problems using tree diagrams V 14
Week 18 HW Chapter 5 1–5, 7 , 9, 19, 21, 11–15, 17, 8, 9, 10, 21, 22	Simulating Distributions. **[SC4]** Binomial probabilities, binomial distributions, normal approximation to the binomial distribution. Law of large numbers. One day is spent in class using the TI-83 calculator to learn how to use PDF and CDF functions and to develop the conditions for the normal approximation to the binomial distribution. **[SC8]**	T pages 374–397

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.

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.

Spring Semester

Week Content	Text and Resource	Materials
Weeks 1–3 HW Chapter 5 25, 27, 29, 33, 35, 37, 39, 41, 43, 44, 67, 64, 66, 69	Simulating Distributions. **[SC4]** Binomial probabilities, binomial distribution, normal approximation for counts and proportions, geometric distributions and probabilities associated with geometric distributions, sampling distribution of a sample mean, central limit theorem. Activity: "Cents and the Central Limit Theorem" Two-day Minitab lab on sampling distributions and the central limit theorem. Write-up due the end of week 3. **[SC10]** Video: *Binomial Distribution, The Sample Mean and Control Charts.* Test.	T pages 401–414; pages 248–431 POD pages 342–346 W Geometric distributions V 17, 18
Weeks 4–6 HW Chapter 6 1–3, 5–7, 11, 13, 15, 17, 22, 24, 26–28, 31, 33, 35, 36, 38, 39, 40–45, 46, 49, 53–59, 75, 76, 78	Confidence Intervals. **[SC5]** Estimating population means, critical values, margin of error, and sample size. Hypothesis testing. Null and alternative hypotheses, p values, statistical significance, z test for population mean, confidence intervals, and two-sided tests. Type I and Type II errors, power, and power curves. Statistical significance, practical significance, and data snooping. Two days are spent on class activities developing the idea of confidence intervals. The candy Skittles is used for CI, "*Introduction to Hypothesis Testing.*" Video: *Confidence Intervals, Significance Tests.* Test.	T pages 434–501 POD pages 482–484; pages 516–526 W Type I and Type II errors, power V 19, 20
Weeks 7–8 HW Chapter 8 1, 2, 4, 9, 11, 13, 19, 23, 25, 27–34, 35, 37, 42, 45, 47, 51, 52, 53, 57–59	Inference for a Single Proportion. Large-sample inference for a population proportion, confidence interval for a population proportion, sample size, and margin of error. Comparing two proportions. Confidence intervals for the difference between two proportions, significance tests for comparing two proportions, pooled estimate of p. Video: *Inference for Proportions.* Test.	T 586–620 V 23

SC4—The course provides instruction in anticipating patterns.

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.

SC5—The course provides instruction in statistical inference.

Week Content	Text and Resource	Materials
Weeks 9–11 HW Chapter 7 1–4, 6–10, 11–15, 19, 25, 29, 35, 37, 38, 43–45, 49, 51–53, 61, 64, 66, 71, 100, 101, 108	The distribution, standard error, one-sample *t* procedures, matched-pairs *t* procedures. Comparison of two means, two-sample *z* statistic, two-sample independent *t* procedure. Activity: Data collected to practice experimental design and run tests of significance using one-sample *t* procedures, matched-pairs *t* procedures, and two independent *t* procedures for means. Write-up including methods, results, and interpretations due at the end of week 10. **[SC7]** Video: *Inference for One Mean, Comparing Two Means*. Project: Analysis of a research article from a peer-reviewed research journal is due at the end of week 12. Students are required to have the topic of their end-of-semester project selected by the end of week 12. Test.	T pages 504–566 W Sign test V 21, 22
Weeks 12–13 HW Chapter 9 1, 2, 3, 17, 7, 19, 21	Contingency and Two-Way Tables. Organizing relations in two-way tables, chi-square test for goodness of fit, homogeneity of proportions, and independence (one- and two-way tables). Activity: M&Ms are used to test x2 goodness of fit. Video: Inference for Two-Way Tables. Test.	T 624–658 W Goodness-of-fit problems V 24
Weeks 14–15 HW Chapter 10 7, 8, 10, 19	Inference for Regression. Simple linear regression model, estimating regression parameters, confidence intervals and inference for the slope, prediction, point estimators, and confidence interval for a future observation. Video: *Inference for Relationships*. One-day computer lab: Inference on slope and confidence and prediction intervals for the LSRL. Time is also spent reading computer and calculator output for the LSRL. **[SC10]** Test.	T 662–709 POD 637–649 1, 3, 4, 5, 6, 15, 18, 19, 20, 21, 23, 25, 29, 32, 33 V 25
Week 16	Review and Prepare for the AP Exam. Students must have their data collected for their semester project by the end of week 16.	W Review packet for the AP Exam
Weeks 17–18	Students spend time in class and in the computer lab working together on their end-of-semester project.	
Week 19 Final Exam	Final Exam. The last six weeks' grade is heavily weighted toward the end-of-semester project and AP review problems.	

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

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.

Notes:

- Not all videos listed are shown during class time. Often students take the videos home to review for class or a test.
- The listed textbook homework problems reflect the order in which the problems are assigned in class.
- The following topics are not specifically mentioned in the course outline. However, these are integrated into the course as needed:
  - Census
  - Observational Study
  - Cluster Sampling
  - Treatments
  - Control Groups
  - Experimental Units
  - Placebo Effect
  - Blinding
  - Generalizability of Results