AP STATISTICS
2013-2014

Course Description:
The AP STATISTICS course is designed to introduce students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. Students will be exposed to four broad conceptual themes: exploring data; planning a study; anticipating patterns; and statistical inference. Upon successful completion of the AP examination at the end of the course, some institutions might offer full credit for the first semester of Statistics.

Because of the demanding nature of this course, it should only be attempted by students that are highly motivated and ready for such work. Students are advised to consult their parents, teachers, and guidance counselors before selecting any AP course. Students will be administered the AP exam for college credit at the end of the course at their own expense. A graphing calculator is required for this course.

Course Content:
The ordering here is intended to define the scope of the course but not necessarily the sequence.

I. Exploring Data: Observing patterns and departures from patterns
- o Exploratory analysis of data makes use of graphical and numerical techniques to study patterns and departures from patterns.
- o Emphasis is placed on interpreting information from graphical and numerical displays and summaries

A. Interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot)
1. Center and spread
2. Clusters and gaps
3. Outliers and other unusual features
4. Shape

B. Summarizing distributions of univariate data
1. Measuring center: median, mean
2. Measuring spread: range, interquartile range, standard deviation
3. Measuring position: quartiles, percentiles, standardized scores (z-scores)
4. Using boxplots
5. The effect of changing units on summary measures

C. Comparing distributions of univariate data (dotplots, back-toback stemplots, parallel boxplots)
1. Comparing center and spread: within group, between group variation
2. Comparing clusters and gaps
3. Comparing outliers and other unusual features
4. Comparing shapes

D. Exploring bivariate data

1. Analyzing patterns in scatterplots
2. Correlation and linearity
3. Least-squares regression line
4. Residual plots, outliers, and influential points
5. Transformations to achieve linearity: logarithmic and power transformations

E. E. Exploring categorical data: frequency tables

1. Marginal and joint frequencies for two-way tables
2. Conditional relative frequencies and association

II. Planning a Study: Deciding what and how to measure

o Data must be collected according to a well-developed plan if valid information on a conjecture is to be obtained. This plan includes clarifying the question and deciding upon a method of data collection and analysis.

A. Overview of methods of data collection

1. Census
2. Sample survey
3. Experiment
4. Observational study

B. Planning and conducting surveys

1. Characteristics of a well-designed and well-conducted survey
2. Populations, samples, and random selection
3. Sources of bias in surveys
4. Simple random sampling
5. Stratified random sampling

C. C. Planning and conducting experiments

1. Characteristics of a well-designed and well-conducted experiment
2. Treatments, control groups, experimental units, random assignments, and replication
3. Sources of bias and confounding, including placebo effect and blinding
4. Completely randomized design
5. Randomized block design, including matched pairs design

D. Generalizability of results from observational studies, experimental studies, and surveys

III. Anticipating Patterns: Producing models using probability theory and simulation

o Probability is the tool used for anticipating what the distribution of data should look like under a given model

B. Probability as relative frequency

1. “Law of large numbers” concept
2. Addition rule, multiplication rule, conditional probability, and independence
3. Discrete random variables and their probability distributions, including binomial
4. Simulation of probability distributions, including binomial and geometric
5. Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable

C. Combining independent random variables

1. Notion of independence versus dependence
2. Mean and standard deviation for sums and differences of independent random variables

D. The normal distribution

1. Properties of the normal distribution
2. Using tables of the normal distribution
3. The normal distribution as a model for measurements

E. D. Sampling distributions

1. Sampling distribution of a sample proportion
2. Sampling distribution of a sample mean
3. Central Limit Theorem

4. Sampling distribution of a difference between two independent sample proportions
5. Sampling distribution of a difference between two independent sample means
6. Simulation of sampling distributions

IV. Statistical Inference: Confirming models
- o Statistical inference guides the selection of appropriate models.

B. Confidence intervals
1. The meaning of a confidence interval
2. Large sample confidence interval for a proportion
3. Large sample confidence interval for a mean
4. Large sample confidence interval for a difference between two proportions
5. Large sample confidence interval for a difference between two means (unpaired and paired)

C. Tests of significance
1. Logic of significance testing, null and alternative hypotheses; p-values; one- and two sided tests; concepts of Type I and Type II errors; concept of power
2. Large sample test for a proportion
3. Large sample test for a mean
4. Large sample test for a difference between two proportions
5. Large sample test for a difference between two means (unpaired and paired)
6. Chi-square test for goodness of fit, homogeneity of proportions, and independence (one- and two-way tables)

D. Special case of normally distributed data
1. t-distribution
2. Single sample t procedures
3. Two sample (independent and matched pairs) t procedures
4. Inference for the slope of least-squares regression line

Required Textbooks and/or Other Reading/Research Materials
An online version of the textbook is available.

The Practice of Statistics, W.H. Freeman and Company, 2012

Course Requirements:
Each student is required to complete all projects, tests, and assignments. Failure to do so will adversely affect the student's overall grade. All students are required to have an AP Board approved graphing calculator. A list of approved calculators can be found at www.apcentral.collegeboard.com (link: Course Descriptions, link: Statistics)

Grade Components/Assessments:
Grades will be based on a point system that will be converted to overall percentages. The following methods will be used to assess and evaluate student performance.
- Assessments: 75-80% for the year
- Assignments: 20-25% for the year

Based on our mission of giving every student a chance to reach his/her fullest potential, students will be allowed to make up work missed due to excused absences as stated in the student handbook and are encouraged to get additional help whenever necessary for better understanding of class concepts.

There are alternative assessments, which will include:

- Practice AP exams
- Projects every chapter
- Graphing calculator and activity-based labs
- Oral presentation of concepts

Each marking period is worth 20% of a student's overall grade. The midterm and final exam are each worth 10% of a student's overall average:

Quarter 1	20%
Quarter 2	20%
Midterm	**10%**
Quarter 3	20%
Quarter 4	20%
Final	**10%**

Required Summer Reading/Assignments:
The summer assignment includes:

Completely READ Chapter 1, and complete the following problems: SECTION 1.1: 5, 6, 15, 19, 25, (MC) 27-32; SECTION 1.2: 37, 45, 54, 65, 67, (MC) 69-74; SECTION 1.3: 79, 81, 89, 94, (MC) 107-109.

The Practice of Statistics, W.H. Freeman and Company, 2012