AP STATISTICS
COURSE SYLLABUS

PRIMARY TEXTBOOK:

    Bock, Velleman, & De Veaux. *STATS: MODELING THE WORLD, Second Edition.* Boston, MA: Pearson Addison Wesley, 2007. ISBN 0-13-187621-X

TECHNOLOGY REQUIREMENTS: TI – 83, TI-83+, TI-84, or TI-84+ Graphing calculator

This is not technically a computational course, but we obviously cannot make decisions and analyze situations without having the correct calculations at our disposal. To this end, we will rely on the statistical package of the TI calculator. Full instruction will be given on how to use these programs. Use of this calculator is required on homework, quizzes, tests, and exams. You will also need the calculator in order to have any success on the AP Exam.

COURSE OUTLINE:

UNIT ONE: EXPLORING AND UNDERSTANDING UNIVARIATE DATA - GRAPHICALLY
        Students are responsible for reading chapter one on their own.
        CHAPTER TWO ($\approx$ 2 days)
        Types of data – quantitative vs. qualitative
        Learning to identify the Who, What, When, Where, Why, and How of data

        HW assignment: # 2 – 24, every other even

        CHAPTER THREE ($\approx$ 3 days)

        Displaying qualitative data – bar charts, frequency tables, pie charts, contingency tables
        Simpson's paradox
        Use of conditional distributions to determine independence

        HW assignment: # 4 - 40, multiples of four

        CHAPTER FOUR ($\approx$ 3 days)
        Displaying quantitative data – histogram, stem plot, dotplot
        Describing distributions – looking at center, shape, spread, clusters, outliers, and gaps

        HW assignment: # 4 – 40, multiples of four

TEST UNIT ONE: CHAPTERS TWO – FOUR

UNIT TWO: EXPLORING AND UNDERSTANDING UNIVARIATE DATA - NUMERICALLY

CHAPTER FIVE ($\approx$ 3 days)
Measures of central tendency – mean, median, and mode
Measures of spread – range, quartiles, standard deviation
Five number summary & the box plot
Variance
Percentiles
Using numerical summaries and boxplots to compare two are more distributions
Resistant measures of center and spread
Changing units' effects on summary measures

HW assignment: # 4 – 48 multiples of four

CHAPTER SIX ($\approx$ 3 days)
Standardized scores – z scores
Normal model – empirical rule – standard normal model
Shifting and rescaling data

HW assignment: # 4 – 48 multiples of four

TEST UNIT TWO: CHAPTERS FIVE AND SIX

UNIT THREE: EXPLORING AND UNDERSTANDING BIVARIATE DATA

CHAPTER 7 ($\approx$ 3 days)
Creating scatterplots by hand & calculator
Explanatory vs. response variables
Analyzing scatterplots for strength, form, and direction
Discussion on what correlation is and isn't
Lurking variables

HW assignment: # 4 – 36 multiples of four

CHAPTER 8 (≈ 3 days)
Calculating least squares regression line by hand and by calculator
Interpreting slope of the LSRL
Interpreting the y-intercept of the LSRL
Using a residual plot to analyze strength of a model
Using computer output to calculate LSRL and make predictions

HW assignment: # 4 – 48 multiples of four

CHAPTER 9 (≈ 2 days)
Conditions for using regression
Affects of outliers, influential points, and leverage
Lurking variables
Dangers of extrapolating

HW assignment: # 4 – 28 multiples of four

CHAPTER 10 (≈ 3 days)
Analyzing scatterplots and regression models for feasibility
Examining residuals for strength of a model
Transforming data using the (x, log y) and the (log x, log y) transformation

HW assignment: # 4 – 32 multiples of four

TEST UNIT THREE: CHAPTERS 7 – 10

FIRST SEMESTER PROJECT: PART ONE - BIVARIATE DATA
Students will be assigned to groups and asked to devise a method of collecting bivariate
data that can be analyzed using the techniques studied this semester. The data must be
collectable in a school setting and should have significance to the school and student body.
Students will collect, analyze, and present their findings to the class in presentations. All
of this is done prior to our study of how to gather data correctly. Students will edit their
methods once we have completed our study of data collection.

UNIT FOUR: HOW TO GATHER DATA

CHAPTER 11 (≈ 2 days)
Random number tables and random number generators (TI – 84)
Using random numbers to perform simulations

HW assignment: # 4 – 36 multiples of four

CHAPTER 12 (≈ 3 days)
Populations and samples – parameters and statistics - census
Activity: Do you still watch cartoons?
Bias – types and effects
Simple random sampling – stratified sampling – cluster sampling – systematic sampling –
        convenience sampling
Undercoverage

HW assignment: # 4 – 32 multiples of four

CHAPTER 13 (≈ 4 days)
Observational study vs. experiment
Principles of good experimental design – control, randomize, replicate, & block
Factors – levels – experimental units – treatments – control groups
Blinding – double blinding – placebo
Designs – randomized block – matched pairs – completely randomized
Confounding

HW assignment: # 4 – 40 multiples of four

TEST UNIT FOUR: CHAPTERS 11 – 13

FIRST SEMESTER PROJECT: PART TWO - BIVARIATE DATA
        Students will be asked to evaluate the method of data collection they followed in part one.
        Having had instruction in proper data collection, they should be able to revise their
        methods and give evidence of bias in their former methods. These revisions and evidences
        should be presented in a paper/presentation. Students are not asked to re-gather the data.
        Particular emphasis is placed on the student's use of statistical vocabulary to appropriately
        communicate their ideas.

UNIT FIVE: RANDOMNESS AND PROBABILITY

CHAPTER 14 ($\approx$ 3 days)
Random phenomenon
Law of large numbers
Complement rule
Mutually exclusive – disjoint – addition rule
Independent events – multiplication rule
Legitimate probability assignments

HW assignment: # 4 – 36 multiples of four

CHAPTER 15 ($\approx$ 3 days)
Sample spaces
General addition & multiplication rules
Conditional probabilities
Independent events
Tree diagrams

HW assignment: # 4 – 44 evens

TEST UNIT FIVE: CHAPTERS 14 – 15

UNIT SIX: PROBABILITY MODELS
CHAPTER 16 ($\approx$ 3 days)
Random variables – discrete & continuous
Expected value
Variance – standard deviation
Sums and differences of random variables

HW assignment: # 4 – 40 multiples of four

CHAPTER 17 ($\approx$ 3 days)
Binomial distribution
Geometric distribution
Normal model as approximation

HW assignment: # 4 – 36 multiples of four

TEST UNIT SIX: CHAPTERS 16 – 17

UNIT SEVEN: SAMPLING DISTRIBUTIONS AND INFERENCE ON PROPORTIONS

CHAPTER 18 ($\approx$3 days)
Sampling variability
Sampling error
Sampling distributions for a proportion
Central Limit Theorem

HW assignment: # 4 – 40 multiples of four

CHAPTER 19 ($\approx$3 days)
Conditions for confidence intervals of proportions
Point estimates
Critical values
Understanding and interpretation of a one-proportion confidence interval
Margin of error
Calculation of one-proportion confidence intervals with and without technology

HW assignment: # 4 – 36 multiples of four

CHAPTER 20 ($\approx$3 days)
Null and alternative hypotheses
One-sided vs. two-sided alternative hypotheses
P-value
Perfoming one-proportion z-test with and without technology
Interpretation of test results

HW assignment: # 2 – 28 evens

CHAPTER 21 ($\approx$3 days)
Alpha levels – significance levels
Critical values
Statistical significance
Error – Type I and II
Power of a test

HW assignment: # 4 – 28 multiples of four

CHAPTER 22 ($\approx$3 days)
Sampling distribution of the difference of two proportions
Confidence interval for the difference between two proportions

Two-proportion z-test

HW assignment: # 4 – 28 multiples of four

TEST UNIT SEVEN: CHAPTERS 18 – 22
UNIT EIGHT: SAMPLING DISTRIBUTION AND INFERENCE ABOUT MEANS

CHAPTER 23 ($\approx$3 days)
T -distribution
Degrees of freedom
One sample confidence interval for the mean
Interpretation and conditions for confidence intervals for means
One sample t-test for the mean
Interpretation and conditions for the t-test
Analyzing computer output for testing of hypotheses

HW assignment: # 4 – 36 multiples of four

CHAPTER 24 ($\approx$3 days)
Sampling distribution for the difference between two means
Two-sample confidence intervals
Two-sample t-tests

HW assignment: # 4 – 32 multiples of four

CHAPTER 25 ($\approx$ 3 days)
Paired data
Paired t-test
Paired – t confidence interval;

HW assignment: # 4 – 28 multiples of four

TEST UNIT EIGHT: CHAPTER 23 – 25

UNIT NINE: INFERENCE ON RELATED VARIABLES

CHAPTER 26 ($\approx$ 3 days)
Chi-square distribution
Chi-square goodness of fit test
Chi-square test of homogeneity
Chi-square test of independence

One vs. two way tables

HW assignment: # 4 – 32 multiples of four

CHAPTER 27 (≈ 3 days)
Conditions for inference on regression
Confidence interval for the slope of a regression line
Hypothesis test for the slope of a regression line
Reading and analyzing computer output

HW assignment: # 4 – 36 multiples of four
TEST UNIT NINE: CHAPTERS 26 – 27

REVIEW FOR AP EXAM

SECOND SEMESTER PROJECT: MAKE A DIFFERENCE
Students are divided into small groups and asked to think about a problem, situation, or phenomenon that is of particular interest to them. They will be asked to gather research as to how their particular problem, situation, or phenomenon has already been studied. They are asked to design an experiment that can be used to further understand their topic of study. They will then be asked to simulate data collection and then apply appropriate inferential analytical techniques. Final presentations will be done in class and students are required to submit a paper describing their methods.

REQUIRED READINGS: Students are expected to read each chapter of study and will be quizzed on the readings prior to lectures on the chapters.