STAT 380: Statistics for Applications
(Adopted - Fall 2017)

Course Description: Descriptive statistics; basic probability rules and distributions; inferences for means, variance and proportions; regression analysis. Prerequisite: MATH 152 with a grade of C or better.

Textbook: Probability and Statistics for Engineering and the Sciences by Jay Devore, Cengage Pub., Ninth Ed. with WebAssign

WebAssign Homework Available - https://goo.gl/j2qFsT

Course Outline and Topics

Chapter 1: Overview and Descriptive Statistics
- 1.1: Populations, Samples, and Processes
- 1.2: Pictorial and Tabular Methods in Descriptive Statistics
- 1.3: Measures of Location
- 1.4: Measures of Variability

Chapter 2: Probability
- 2.1: Sample Spaces and Events
- 2.2: Axioms, Interpretations, and Properties of Probability
- 2.3: Counting Techniques
- 2.4: Conditional Probability
- 2.5: Independence

Chapter 3: Discrete Random Variables and Probability Distributions
- 3.1: Random Variables
- 3.2: Probability Distributions for Discrete Random Variables
- 3.3: Expected Values
- 3.4: The Binomial Probability Distribution
- 3.5: Hypergeometric and Negative Binomial Distributions
- 3.6: The Poisson Probability Distribution

Chapter 4: Continuous Random Variables and Probability Distributions
- 4.1: Probability Density Functions
- 4.2: Cumulative Distribution Functions and Expected Values
- 4.3: The Normal Distribution
- 4.4: The Exponential and Gamma Distributions

Chapter 5: Joint Probability Distributions and Random Samples
- 5.3: Statistics and Their Distributions
- 5.4: The Distribution of the Sample Mean

Chapter 6: Point Estimation
- 6.1: Some General Concepts of Point Estimation

Chapter 7: Statistical Intervals Based on a Single Sample
- 7.1: Basic Properties of Confidence Intervals
- 7.2: Large-Sample Confidence Intervals for a Population Mean and Proportion
- 7.3: Intervals Based on a Normal Population Distribution
- 7.4: Confidence Intervals for the Variance and Standard Deviation of a Normal Population

Chapter 8: Tests of Hypotheses Based on a Single Sample
- 8.1: Hypotheses and Test Procedures
- 8.2: z Tests for Hypotheses about a Population Mean
- 8.3: The One-Sample t Test
- 8.4: Tests Concerning a Population Proportion
- 8.5: Further Aspects of Hypothesis Testing *

Chapter 9: Inferences Based on Two Samples
- 9.1: z Tests and Confidence Intervals for a Difference Between Two Population Means
- 9.2: The Two-Sample t Test and Confidence Interval
- 9.3: Analysis of Paired Data
- 9.4: Inferences Concerning a Difference Between Population Proportions
- 9.5: Inferences Concerning Two Population Variances *

Chapter 12: Simple Linear Regression and Correlation
- 12.1: The Simple Linear Regression Model
- 12.2: Estimating Model Parameters
- 12.3: Inferences About the Slope Parameter
- 12.4: Prediction of Future values *
- 12.5: Correlation

The suggested class period per chapter assumes two 75-minute class periods per week (total of 30 class periods per semester) with two exams per semester.

* Optional topic

Any instructor should cover all of the material specified, except the starred sections which are optional.

Weekly Computer Laboratory (50 minutes of hands-on tutorials/exercises)

Laboratory tutorials and exercises will be distributed online and/or through Blackboard.

Major Parts

I. Data Cleaning and Preparation
II. Data Summary and Visualization
III. Data Analysis, Modelling and Inference

Course objectives: (added by Department consent, Fall 2015)

After the completion of Stat 380, students will be able to

- understand basic concepts in probability including random experiments, sample spaces and events, mutual exclusivity, conditional probability, independence, and Bayes theorem.
- solve problems in counting and probability using techniques including permutations and combinations.
- understand the motivation for using probability models to describe the behavior of real-life processes.
- understand the concept of random variables, probability mass functions and densities, and cumulative distributions.
- understand the concept of expectation and be able to apply it in decision making.
- understand summary measures such as the mean and variance of a random variable.
- know families of discrete and continuous probability models and how they are used in practice.
- understand the significance of the connection between probability and statistics and how it relates in applications.
- understand the role of randomness and sampling distributions in statistical applications.
- understand and perform basic statistical inference such as confidence intervals, hypothesis testing, regression, and analysis of variance.
- organize and represent data, recognize and describe relationships, and perform basic statistical inference using a statistical software such as Minitab, R, etc.