Syllabus

MAT 200 Statistics

General Information

Date March 3rd, 2023

Author Daniel Groom

Department Mathematics

Course Prefix MAT

Course Number 200

Course Title Statistics

Course Information

Catalog Description This statistics course is designed for an experienced mathematics student. It is a one semester course covering descriptive and inferential statistics. Topics included are measures of center; measures of dispersion; hypothesis testing; estimations for population means, proportions, and variance; determination of sample size; uses of the Chi-square distribution; analysis of variance; linear correlation and linear regression; and statistical research. The course will emphasize computer or calculator use (graphing calculator, Minitab, Excel, StatCrunch, etc.) to obtain results.

Credit Hours 3

Lecture Contact Hours 3

Lab Contact Hours 0

Other Contact Hours 0

Grading Scheme Letter

Prerequisites

MAT 145 or test into Level 3

Co-requisites

None

First Year Experience/Capstone Designation

This course DOES NOT satisfy the outcomes applicable for status as a FYE or Capstone.

SUNY General Education

This course is designated as satisfying a requirement in the following SUNY Gen Ed category
Mathematics (and Quantitative Reasoning)

FLCC Values

Institutional Learning Outcomes Addressed by the Course
Inquiry and Interconnectedness

Course Learning Outcomes

Course Learning Outcomes

1. Collect, summarize, and analyze sample data.
2. Apply probability distributions and sampling distributions to calculate probabilities.
3. Use confidence intervals to estimate population parameters.
4. Use hypothesis testing to evaluate claims.
5. Interpret the results of statistical procedures and evaluate them for reasonableness.

Outline of Topics Covered

1) Fundamental terminology and concepts
   a) Population vs. sample
   b) Parameter vs. statistic
   c) Variables
   d) Data – quantitative vs. qualitative; discrete vs. continuous
   e) Sampling methods
2) Computing and interpreting measures of central tendency and dispersion
   a) Mean
   b) Variance and standard deviation
3) Probability distributions of random variables
   a) Random variable: discrete vs. continuous
   b) The concept of a probability distribution
   c) Representations of a probability distribution
   d) Computing and interpreting mean/standard deviation of a probability distribution
   e) Binomial probability distribution
      i) Properties of a binomial experiment
      ii) Computing binomial probabilities
4) Normal Distribution

a) Computing and interpreting standard score (z-score)
b) Empirical rule
c) Techniques for identifying outliers
d) Properties of a normal distribution
e) Computing the probability of a normal variable
f) Calculating the value of a normal variable from proportion/probability
g) Assessing normality of a sample
h) Normal distribution approximations of a binomial distribution (Optional)

5) Bivariate Data
a) Scatter plot
b) Types of correlation (IE: linear, quadratic, exponential, etc.)
c) Correlation vs. causation
d) Linear (main focus)
i) Identifying the direction of the relationship
ii) Measuring strength of the relationship
iii) Using linear regression to make predictions
iv) Restrictions on using linear regression.
v) Calculation and interpretation of residuals

6) Sample Variability
a) Sampling distributions for x-bar, p-hat, and s2.
b) Central limit theorem with applications

7) Introduction to Statistical Inference
a) Estimation of population parameters via confidence intervals
b) Conducting hypothesis tests using Classical and Probability Value approaches

8) Inferences Involving One Population
a) Create and interpret confidence intervals for the population
i) Mean
ii) Proportion
iii) Standard deviation/variance
b) Conduct hypothesis tests for the population
i) Mean
ii) Proportion
iii) Standard deviation/variance
c) Determine the sample size needed for a given margin of error at a given level of confidence for both
means and proportions.

9) Inferences Involving Two Populations
a) Independent and dependent samples
b) Create and interpret confidence intervals for the
i) difference between two independent means
ii) difference between two dependent means
iii) difference between two population proportions
c) Conduct hypothesis tests for
i) two independent means
ii) two dependent means
iii) two population proportions
iv) two population variances/standard deviations

10) Additional Applications of Chi-square
   a) Goodness of fit test.
   b) Test for Independence.
11) Analysis of Variance
   a) Introduction to the Analysis of Variance technique
   b) The logic behind ANOVA
   c) Applications of Single-Factor ANOVA
12) Intro to Design of Experiments
   a) Single vs. Double Blind
   b) Designs of experiments
      i) Randomized
      ii) Matched pairs
      iii) Randomized block