Course Outline for: MATH 1080 Introduction to Statistics

A. Course Description:

1. Number of credits: 4
2. Lecture hours per week: 4
3. Prerequisites: MATH 0630 (C- or better); OR
   MATH 0980 (C- or better); OR
   MATH 0991 (C- or better); OR
   Math 0601, 0602, or 0603 with mastery of sufficient topics; or
   High School GPA: 2.70+; OR
   Accuplacer Quantitative Reason Score of 265+; OR
   MCA Math score: 1148-1157
4. Corequisites: None
5. MnTC Goals: Goal 4 Mathematical/Logical Reasoning

This course covers concepts and applications of descriptive statistics, probability, and inferential statistics. Descriptive statistics topics include graphical representations, measures of center, measures of variation, and measures of relative standing. Probability topics include rules of probability, Binomial, Normal and other theoretical distributions. Inferential statistics topics include estimation, hypothesis testing for several situations, including simple linear regression, chi-square tests and one-way analysis of variance (ANOVA).

B. Date last reviewed/updated: January 2024

C. Outline of Major Content Areas:

1. Elements of experimental design - controlled experiments vs. observational studies.
2. Statistical variables and variable values.
3. Numerical measures of central tendency/variability - mean, median, mode, standard deviation, z-scores, and percentile rank.
4. Graphical summaries of data including histograms and scatterplots – histograms.
5. Normal approximation to data.
6. Correlation coefficient and linear regression.
7. Expected value and standard error for sampling distributions and their differences for two samples.
8. Central limit theorem.
9. Confidence intervals for population means and proportions.
10. One and two sample hypothesis testing (z and t).
11. Chi-square test.
12. One way analysis of variance.
13. Additional topics may include nonparametric tests, control charts, etc.

D. Course Learning Outcomes:

Upon successful completion of the course, the student will be able to:

1. Compute mean, median, modes, standard deviation, z-scores and percentile ranks from data, and interpret these numerical measures. (Goal 2b, 4b)
2. Construct histograms and graphical descriptions of numerical data, and estimate the common numerical measures from them. (Goal 2a, 4b)
3. Apply the normal approximation to estimate percentages and percentiles for data that are normally distributed. (Goal 4b, d)
4. Compute and interpret correlation coefficient as a measure of the strength of the linear association between two numerical variables. (Goal 4a, b, d)
5. Apply regression methods to estimate dependent variable values from a single independent variable value, and interpret the slope and constant in regression equations. (Goal 4a, b, c, d)
6. Compute and interpret the expected value and standard error for probability distributions. (Goal 2b, 4b, d)
7. Apply the central limit theorem to estimate probabilities of sample means and percentages falling in a range of values. (Goal 2a, c, 4b, d)
8. Compute and interpret confidence intervals for means and proportions. (Goal 2a, b, c, 4a, b, d)
9. Evaluate one and two sample hypothesis tests (z or t) for population means and percentages, including the formulation of null/alternative and interpretation of p-value. (Goal 2a, c, 4a, b, c, d)
10. Perform Chi-square tests of goodness of fit, independence, and homogeneity. (Goal 4a, b, c, d)
11. Perform analysis of variance. (Goal 4a, b, c, d)
12. Perform simple statistical procedures related to the above using a statistical package (e.g. Statcrunch, R, or Excel). (Goal 4a,b, d)

E. Methods for Assessing Student Learning:

Methods for assessment may include, but are not limited to, the following:

1. In-class testing
2. Take-home testing
3. Assignments
4. Quizzes
5. Attendance
6. Group or individual projects
7. Research

F. Special Information:

This class will use a technology such as Statcrunch, Excel or Minitab.