

STA 296 STATISTICAL METHODS AND MOTIVATIONS (UK Course) (3 credit hours)[LDUC Course Form](#)

Official Course Description	Introduction to principles of statistics with emphasis on conceptual understanding. Students will articulate results of statistical description of sample data (including bivariate), application of probability distributions, confidence interval estimation and hypothesis testing to demonstrate properly contextualized analysis of real-world data. Prerequisites: MA 113, MA 123, MA 137 or equivalent.
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OFFICIAL COURSE COMPETENCIES/OBJECTIVES

Upon completion of this course, the student can:

1. Demonstrate understanding of p-value, margins of error and confidence intervals, formal hypothesis tests through their creation or evaluation.
2. Generate and/or analyze critically quantitative and graphic data summaries in their real-world contexts.
3. Integrate knowledge from huge reservoir of available data and illustrate their comprehension of that knowledge through individual summarization.

OFFICIAL COURSE OUTLINE (Approved Fall 2014)

I. Data

- A. Data Collection
- B. Sample Designs
- C. Categorical vs. Quantitative Data

II. Descriptive Statistics

- A. Summarizing Categorical Data
- B. Summarizing Quantitative Data
- C. Measures of Center
- D. Measures of Spread
- E. Standard Deviation
- F. Sensitivity and Specificity

III. Probability

- A. Probability Rules
- B. Joint Probability and Contingency Tables
- C. Conditional Probability

IV. Random Variables

- A. Discrete Random Variables
- B. Binomial Probability Distributions
- C. Continuous Probability Distributions
- D. Normal Distributions E. t-Distributions

V. Sampling Distributions

- A. Sampling Distribution for Proportions
- B. Central Limit Theorem
- C. Sampling Distribution for Means

VI. Confidence Intervals

- A. Confidence Intervals for Proportions
- B. Confidence Intervals for Means
- C. Margin of Error
- D. Assumptions
- E. Sample Size

VII. Hypothesis Testing

- A. Hypotheses
- B. P-values
- C. Reasoning
- D. Testing Hypotheses about the Mean
- E. Testing Hypotheses about the Proportion

VIII. Comparing Means

- A. Difference between Two Means – Dependent Samples
- B. Difference between Two Means – Independent Samples

IX. Comparing Proportions

- A. Goodness of Fit Tests
- B. Chi-Square Interpretation
- C. Chi-Square Test of Homogeneity
- D. Chi-Square Test of Independence

X. Linear Regression

- A. Correlation
- B. Linear Model
- C. Assumptions
- D. Test for the Regression Slope

GENERAL EDUCATION COMPETENCIES

- A. Knowledge of human cultures and the physical and natural worlds through study in the sciences and mathematics, social sciences, humanities, histories, languages, and the arts.
- B. Intellectual and practical skills, including
 - inquiry and analysis
 - critical and creative thinking
 - written and oral communication
 - quantitative literacy
 - information literacy
 - teamwork and problem solving
- C. Personal and social responsibility, including
 - civic knowledge and engagement (local and global)
 - intercultural knowledge and competence
 - ethical reasoning and action
 - foundations and skills for lifelong learning
- D. Integrative and applied learning, including synthesis and advanced accomplishment across general and specialized skills.

STUDENT LEARNING OUTCOMES FOR QUANTITATIVE REASONING (Approved Fall 2017)

1. Interpret Information presented in mathematical and/or statistical forms. (B)
 - Summarize data with measures of center and measures of spread.
 - Identify and explain sensitivity and specificity.
2. Illustrate and communicate mathematical and/or statistical information symbolically, visually, and/or numerically. (A, B and C)
 - Summarize categorical data in graphical form.
 - Summarize quantitative data in graphical form.
3. Determine when computations are needed and execute the appropriate computations. (B)
 - Properly apply rules of probability.
 - Calculate joint and conditional probability.
 - Find the probability, mean and standard deviation for discrete and continuous probability distributions.
4. Apply an appropriate model to the problem to be solved. (A, C and D)
 - Construct a linear model for a regression problem.
 - Predict an outcome within the range of a linear model.
5. Make inferences, evaluate assumptions, and assess limitations in estimation modeling and/or statistical analysis. (B, C and D)
 - Construct and interpret confidence intervals for a mean and proportion.
 - Conduct hypothesis testing for a mean and proportion.
 - Construct and interpret confidence intervals for the difference between two means.
 - Conduct hypothesis testing for the difference between two means.

LEARNING RESOURCES

- ✓ Rayens, William (2013 or latest edition). Making Sense of Uncertainty: Activities for Teaching Statistical Reasoning. Van-Griner Publishing. ISBN-13: 978-1-61740-106-0
- ✓ My Stat Lab