

**STAT 301 – Statistics I**

**Fall 2015**

**1. Catalog Description**

**STAT 301 Statistics I (4)**

Introduction to statistics for mathematically inclined students, focused on process of statistical investigations. Observational studies, controlled experiments, randomization, confounding, randomization tests, hypergeometric distribution, descriptive statistics, sampling, bias, binomial distribution, significance tests, confidence intervals, normal model,  $t$ -procedures, two-sample procedures. Substantial use of statistical software. Not open to students with credit in STAT 322. 4 lectures. Prerequisite or concurrent: MATH 141.

**2. Required Background and/or Experience**

MATH 141

**3. Expected Outcomes**

The student should be able to:

- a) Describe the process of statistical thinking, from data collection through statistical inference and interpretation of results, and be able to apply it in various settings
- b) Distinguish observational studies and controlled experiments and the scope of conclusions that each permits
- c) Conduct and interpret descriptive analyses of data, including graphical and numerical summaries, for categorical and quantitative data
- d) Explain fundamental concepts of statistical inference, such as confidence and significance, including limitations of these procedures and how the application of the procedures relates to the randomness inherent in the design of the study
- e) Conduct and interpret tests of significance, including binomial tests, Fisher's exact test,  $z$ -tests for a proportion and difference in proportions, and  $t$ -tests for a mean and difference in means
- f) Construct and interpret one- and two-sample confidence intervals
- g) Utilize basic probability models as applied to statistical analyses

**4. Text and References**

**Text:** Chance, B. and Rossman, A., *Investigating Statistical Concepts, Applications, and Methods*, 2015.

**5. Minimum Student Materials**

Calculator and access to statistical software for student use in preparing assignments and taking exams.

**6. Minimum University Facilities**

Computer-equipped classroom with statistical software for student use, and chalkboard for instructional use.

7. **Expanded Description of Content and Method**

<i>Content:</i>	<i>Number of Lectures</i>
<b>1) Probability and Simulation</b>	2
Introduction to simulation, basic probability rules	
<b>2) Statistical Significance</b>	8
Simulation of binomial test, concept of statistical significance, p-value, combinations, binomial distribution, normal approximation, z-tests, types of errors, concept of power	
<b>3) Confidence Intervals</b>	4
One sample confidence intervals for population proportion, binomial and z-procedures, alternative interval procedures	
<b>4) Sampling</b>	2
Population vs. sample, parameter vs. statistic, sampling bias, simple random sampling	
<b>5) Inference for two proportions</b>	9
Randomization tests, permutations, hypergeometric probabilities, Fisher's Exact Test, z-procedures, observations studies vs. experiments, scope of conclusions, relative risk	
<b>6) Quantitative data</b>	11
Descriptive statistics, histograms, boxplots, numerical summaries, sampling distributions, simulation of randomization tests, one and two sample <i>t</i> -procedures, matched pairs	
<b>Total</b>	36

8. **Method of Evaluating Outcome**

Student learning will be assessed through homework assignments, project assignments, midterm exams, and a final exam.