

MTH 161 STATISTICS II

The individual instructor is responsible for his/her own final exam plans.

The main purpose of this course is the continuation and extension of the study of the techniques of inferential statistics studied in MTH 160. There is an emphasis on the problems and procedures of statistical experimentation, with each student becoming directly involved with the design of an experiment and familiar with the three aspects of researching such an experiment: 1) planning, 2) sampling, and 3) drawing conclusions.

1. Statistical Inference - Estimation and Hypothesis Testing

(One population; two populations)

- 1.1 Know the general procedure for any hypothesis test and be able to perform the following tests:
 - a. testing two independent means (using z or t as test statistics)
 - b. testing two dependent means
 - c. testing two proportions
 - d. testing two variances
- 1.2 Be able to construct confidence interval estimates for
 - a. difference of means
 - b. mean value of paired difference
 - c. difference of two proportions
 - d. ratio of two variations
- 1.3 Understand and be able to use the $F(df_1, df_2, \alpha)$ notation.

2. Type II Error and Sample Size

- 2.1 Know the meaning of the type II error and be able to calculate the type II error in some situations.
- 2.2 Know and understand the relationship between α and β , n , and d .
- 2.3 Be able to calculate or look up the sample size necessary to meet the specified restrictions of an inference problem dealing with
 - a. one mean
 - b. two proportions
 - c. two variances

3. Use of Chi-Square

- 3.1 Be able to distinguish between problems that can be solved using chi-square and those that cannot.
- 3.2 Be able to distinguish between types of chi-square tests:
 - a. multinomial
 - b. contingency tables
 - c. goodness-of-fit
- 3.3 Be able to complete tests using all three types of chi-square tests.

4. Analysis of Variances

- 4.1 Understand the basic concepts of Analysis of Variance.
- 4.2 Be able to recognize when (and when not) to apply ANOVA technique.
- 4.3 Be able to carry out an ANOVA solution for problems involving:
 - a. one-factor
 - b. two-factor without replication
 - c. two-factor with replication

5. Correlation and Regression Analysis

- 5.1 Understand and be able to calculate covariance.
- 5.2 Be able to complete inferences about ρ , the population value of linear correlation.
- 5.3 Be able to test the calculated line of regression for lack of fit and for regression.
- 5.4 Be able to construct confidence interval estimates for the mean value of y at a given value of x , and y value at a given x .
- 5.5 Understand the relationship between the difference between correlation and regression analysis.

6. Non-parametric Statistics

- 6.1 Be aware of the existence of the multitude of kinds of non-parametrics that exist.
- 6.2 Understand the idea of "distribution free" statistics in reference to the lessening of restrictions.
- 6.3 Be familiar with and able to complete:
 - a. sign test
 - b. median test
 - c. Runs test
 - d. Mann-Whitney U test
 - e. Spearman's Rank Correlation test.
- 6.4 Understand the comparison between the non-parametric and the parametric method.
- 6.5 Be able to determine when specific non-parametrics may be applied and be able to determine when a parametric method could be used.

7. Statistical Experimentation

- 7.1 Be aware of the types of problems that can be solved by use of statistical methods (as well as types that cannot be solved).
- 7.2 Have demonstrated his awareness of the realities of statistical experimentation by carrying out an independent research project in a chosen field of interest. The project(s) shall include:
 - a. development of objectives
 - b. development of sampling plans
 - c. selection of statistical techniques
 - d. observation of a sample
 - e. calculations and descriptions
 - f. completion of statistical inferences
 - g. conclusions