Tennessee Technological University
Mathematics Department

MATH 3070: Statistical Methods I

I. COURSE DESCRIPTION FROM CATALOG:

Introduction to parametric statistical methods with some non-parametric alternatives, sampling, probability, Type I and Type II Error, sample size estimation, confidence interval estimation, and test hypotheses using normal, Student's t, Snedecor's F, Chi-Square, and the binomial distributions linear regression, analysis of variance, and data analysis utilizing statistical software. Lec. 3-3. Cr. 3-3.

II. PREREQUISITE(S): It is recommended that students complete MATH 1130 with a C or better before taking MATH 3070.

III. COURSE OBJECTIVES(S):

Ability to apply basic statistical methodology for data analysis that is applicable in a variety of scientific disciplines. Ability to use computer programs to summarize and present data for statistical analysis.

IV. TOPICS TO BE COVERED:

Chapter 1 **What is Statistics?**
1.1 Introduction
1.2 Why Study Statistics?
1.3 Some Current Applications of Statistics
1.4 What Do Statisticians Do?
1.5 Quality and Process Improvement
1.6 A Note to the Student
1.7 Summary

Chapter 2 **Using Surveys and Scientific Studies to Gather Data**
2.1 Introduction
2.2 Surveys
2.3 Scientific Studies
2.4 Observational Studies
2.5 Data Management: Preparing Data for Summarization and Analysis
2.6 Summary

Chapter 3 **Summarizing Data**
3.1 Introduction
3.2 Calculators, Computers, and Software Systems
3.3 Describing Data on a Single Variable: Graphical Methods
3.4 Describing Data on a Single Variable: Measures of Central Tendency
3.5 Describing Data on a Single Variable: Measures of Variability
3.6 The Boxplot
3.7 Summarizing Data from More Than One Variable
3.8 Summary

Chapter **4 Probability and Probability Distributions**
4.1 How Probability Can Be Used in Making Inferences
4.2 Finding the Probability of an Event
4.3 Basic Event Relations and Probability Laws
4.4 Conditional Probability and Independence
4.5 Bayes' Formula
4.6 Variables: Discrete and Continuous
4.7 Probability Distributions for Discrete Random Variables
4.8 A Useful Discrete Random Variable: The Binomial
4.9 Probability Distributions for the Continuous Random Variable
4.10 A Useful Continuous Random Variable: The Normal Distribution
4.11 Random Sampling
4.12 Sampling Distributions
4.13 Normal Approximation to this Binomial
4.14 Minitab Instructions (Omit)
4.15 Summary

Chapter 5 **Inferences about Population Central Values**
5.1 Introduction and Case Study

Students with a disability requiring accommodations should contact the Office of Disability Services (ODS). An Accommodation Request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The ODS is located in the Roaden University Center, Room 112; phone 372-6119.

5.2 Estimation of μ
5.3 Choosing the Sample Size for Estimating μ
5.4 A Statistical Test for μ
5.5 Choosing the Sample Size for μ
5.6 The Level of Significance of a Statistical Test
5.7 Inferences about μ for a Normal Population, σ unknown
5.8 Inferences about the Median
5.9 Summary

Chapter 6 **Inferences Comparing Two Population Central Values**
6.1 Introduction and Case Study
6.2 Inferences about $\mu_1 - \mu_2$: Independent Samples
6.3 A Nonparametric Alternative: The Wilcoxon Rank Sum Test
6.4 Inferences about $\mu_1 - \mu_2$: Paired Data
6.5 A Nonparametric Alternative: The Wilcoxon Signed-Rank Test
6.6 Choosing the Sample Sizes for Inferences about $\mu_1 - \mu_2$
6.7 Summary

Chapter 7 **Inferences about Population Variances**
7.1 Introduction and Case Study
7.2 Estimation and Tests for a Population Variance
7.3 Estimation and Tests for Comparing Two Population Variances
7.4 Test for Comparing t>2 Population Variances
7.5 Summary

Chapter 8 **Inferences about More than Two Population Central Values**
8.1 Introduction and Case Study
8.2 A Statistical Test about More Than Two Population Means: An Analysis of Variance
8.3 The Model for Observations in a Completely Randomized Design
8.4 Checking on the AOV Conditions
8.5 An Alternative Analysis: Transformations of the Data
8.6 A Nonparametric Alternative: The Kruskal-Wallis Test
8.7 Summary

Chapter 9 **Multiple Comparisons**
9.1 Introduction and Case Study
9.2 Linear Contrasts
9.3 Which Error Rate Is Controlled?
9.4 Fisher's Least Significant Difference
9.5 Tukey's W Procedure
9.6 Student-Newman-Keuls Procedure
9.7 Dunnett's Procedure: Comparison of Treatments to a Control
9.8 Sheffe's Method
9.9 Summary

Chapter 10 **Categorical Data**
10.1 Introduction and Case Study
10.2 Inferences about a Population Proportion π
10.3 Inferences about the Difference between Two Population Proportions: $\pi_1 - \pi_2$
10.4 Inferences about Several Proportions: Chi-Square Goodness-of-Fit Test
10.5 The Poisson Distribution
10.6 Contingency Tables: Tests for Independence and Homogeneity
10.7 Measuring Strength of Relation
10.8 Odds and Odds Ratios
10.9 Summary

V. ADDITIONAL INFORMATION:

VI. POSSIBLE TEXTS AND REFERENCES:

An Introduction to Statistical Methods and Data Analysis by R. Lyman Ott and Michael Longnecker, Fifth Edition

VII. ANY TECHNOLOGY THAT MAY BE USED:

SAS on PC lab computer and calculator

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