

**Tennessee Technological University
Mathematics Department**

MATH 6270: Mathematical Statistics

I. COURSE DESCRIPTION FROM CATALOG:

Statistical hypothesis, uniform most powerful test, sufficient statistics, completeness, Rao-Cramer inequality sequential probability ratio test, analysis of variance, multiple comparisons, non-parametric techniques. Lec. 3. Cr. 3.

II. PREREQUISITE(S):

Consent of instructor.

III. COURSE OBJECTIVE(S):

To study Chi-Square Goodness of fit Test, Test for equality of means. non-central Distributions, Non-parametric methods. Wilcoxon and Mann-Whitney Tests. Sufficient and Complete Sufficient Statistics, Rank Statistics and Rao-Blackwell Inequalities.

IV. STUDENT LEARNING OUTCOMES:

Students should be able to define:

Central limit theorem.

Sufficiency, completeness, and independence of a statistic.

The likelihood function for a set of probability density and distribution functions.

The maximum likelihood estimator for a given probability model and dataset.

The Normal General Linear Model in matrix form.

Students should be able to calculate:

The distribution of a statistic using the Central limit theorem using the delta method.

The likelihood for a given probability model and dataset.

The maximum likelihood estimator for a probability model and dataset when a closed form solution exists.

The mean, variance, and Cramer-Rao Lower Bound of the MLE.

Mean vectors and correlation matrices for general linear models with normally distributed errors and linear combinations of related parameters of interest.

Students should be able to implement the likelihood ratio test for a given probability model and dataset.

Students should be able to assess whether a statistic is sufficient, complete, and independent for a member of the exponential class of distributions.

V. TOPICS TO BE COVERED:

CHAPTER 8 Other statistical Tests

8.1 Chi-Square Tests

8.2 The Distributions of Certain Quadratic Forms

8.3 A Test of the Equality of Several Means

8.4 Noncentral and Noncentral F

8.5 The Analysis of Variance

8.6 A Regression Problem

CHAPTER 9 Nonparametric Methods

9.1 Confidence Intervals for Distribution Qualities

9.2 Tolerance Limits for Distributions

9.3 The Sign Test

9.4 A Test of Wilcoxon

9.5 The Equality of Two Distributions

9.6 The Mann-Whitney-Wilcoxon Test

9.7 Distributions Under Alternative Hypotheses 9.8 Linear Rank statistics

CHAPTER 10 Sufficient Statistics

10.1 A Sufficient statistic for a Parameter

10.2 The Rao-Blackwell Theorem

10.3 Completeness and Uniqueness

10.4 The Exponential Class of Probability Density Functions

10.5 Functions of a Parameter

10.6 The Case of Several Parameters

CHAPTER 11 Further Topics in statistical Inference

11.1 The Rao-Cramer Inequality

11.2 The Sequential Probability Ratio Test

VI. ADDITIONAL INFORMATION:

VII. POSSIBLE TEXTS AND REFERENCES:

Introduction to Mathematical Statistics, 6th edition, Hogg and Craig

VIII. ANY TECHNOLOGY THAT MAY BE USED:

IX. STUDENT ACADEMIC MISCONDUCT POLICY:

Maintaining high standards of academic integrity in every class at Tennessee Tech is critical to the reputation of Tennessee Tech, its students, alumni, and the employers of Tennessee Tech graduates. The Student Academic Misconduct Policy describes the definitions of academic misconduct and policies and procedures for addressing Academic Misconduct at Tennessee Tech. For details, view the Tennessee Tech's Policy 217 – Student Academic Misconduct at [Policy Central](#).

X. DISABILITY ACCOMMODATION:

Students with a disability requiring accommodations should contact the Accessible Education Center (AEC). An Accommodation Request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The AEC is located in the Roaden University Center, Room 112; phone 931-372-6119. For details, view the Tennessee Tech's Policy 340 – [Services for Students with Disabilities at Policy Central](#).