Tennessee Technological University
Mathematics Department

MATH 4470-4480/5470-5480: Probability and Statistics I-II

I. COURSE DESCRIPTION FROM CATALOG:

Topics include probability density and distribution functions, transformation of random variables, limiting/convergence distributions, concepts of estimation and testing hypotheses, and sufficient statistics. Lec. 3-3. Cr. 3-3.

II. PREREQUISITE(S):

MATH 4470: C or better in MATH 2110 or consent of instructor.
MATH 4480: C or better in MATH 4470 or 5480.

III. COURSE OBJECTIVE(S):

To introduce calculus-based probability and statistical models.

IV. STUDENT LEARNING OUTCOMES:

MATH 4470/5470

Upon successful completion of the course students will understand the fundamental principles of probability theory and statistical reasoning; gain problem-solving skills in calculating probability and expectation of standard distributions of random variables; acquire skills in basic data collection, descriptive statistics, and exploratory graphics; and utilize appropriate technology to create simulations of probabilistic models as a supporting skill for probability theory and basic data analysis.

MATH 4480/5480

Upon successful completion of the course students will develop a greater understanding of the fundamental principles of probability theory and statistical reasoning and the skills of basic data collection, descriptive statistics, and exploratory graphics; develop written communication skills in statistical investigations, hypotheses and significance of results; utilize existing high-level statistical software to create numerical as well as graphical results in modern computationally intensive statistical methods and simulation; and write a report using statistical theory and methodology.

V. TOPICS TO BE COVERED:

MATH 4470/5470 Topics

Probability and Distributions
Set Theory, Probability Set Functions, Conditional Probability and Independence, Random Variables of the Continuous Type, Properties of the Distribution Function, Expectation of a Random Variable, Special Expectations, Chebyshev's and other Inequalities

Multivariate Distributions
Distributions of Two Random Variables, Bivariate Random Variables, Conditional Distributions and Expectations, Correlation Coefficient, Independent Random Variables, Extension to Several Random Variables

Special Distributions
The Binomial and Related Distributions, Poisson, Gamma and Chi-Square Distributions, Normal Distribution, Bivariate Normal Distribution, t- and F- Distribution.

Elementary Statistical Inference
Sampling and Statistics, confidence intervals, order statistics, hypothesis testing, simulation-based tests.

MATH 4480/5480 Topics

Limiting Distributions
Convergence in Distribution, Convergence in Probability, Limiting Moment-Generating Functions, The Central Limit Theorem, Theorems on Limiting Distributions.

Maximum Likelihood
Point Estimation, Rao-Cramer lower bound, Tests, Extensions in the multiparameter case.

Sufficient Statistics
Measures of Quality of Estimators, Sufficient Statistic for a Parameter, Properties of a Sufficient Statistic, Completeness and Uniqueness, The Exponential Class of Probability Density Functions, Functions of a Parameter, The Case of Several Parameters, Minimal Sufficient and Ancillary Statistics, Sufficiency, Completeness, and Independence

VI. ADDITIONAL INFORMATION:
Graduate credit is earned on the basis of additional work required by the instructor per TTU Graduate Catalog.

VII. POSSIBLE TEXTS AND REFERENCES:
Introduction to Mathematical Statistics by Robert V. Hogg and Allen T. Craig, 8th Edition

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 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. For details, view the Tennessee Tech's Policy 340 – Services for Students with Disabilities at Policy Central.