

**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 multiparameteruC2iq