Salisbury University Department of Mathematical Sciences

MATH 413/513 : Mathematical Statistics I
Syllabus (Tentative)

Description: Axioms and algebra of probability, discrete and continuous random variables, multivariate distributions, limit theorems. 4 Hours Credit: Meets four hours per week.

Prerequisites: C or better in MATH 213 or MATH 216, and MATH 310.

Intended Audience: Students in Mathematics or Physical Sciences.

Objective: To learn how to construct and use probability models with an emphasis on proofs, formal reasoning and communicating mathematics in writing. In particular, introduce how probability models support the theory of statistical inference.

Textbooks: *Mathematical Statistics with Applications*, 7th edition by: Wackerly, Mendenhall & Schaeffer

Topic	Weeks
Introduction to Probability	3
Set theory; Notation, terminology, and definition of probability; Properties of probability; counting techniques; Conditional probability; independence; Bayes theorem.	
Random Variables and Distributions	2.5
Discrete distributions, continuous distributions; Expected value, variance, covariance and their properties; Moment generating function (MGF).	
Special Distributions	2.5
Binomial, hypergeometric, Poisson, negative binomial, exponential, normal, gamma, beta distributions; deriving MGF's, finding mean and variance for each, exploring connections among these distributions.	
Joint Distributions	2.5
Definitions of joint discrete and continuous distributions, independent random variables, marginal and conditional distributions, conditional expected value and variance, correlation; joint MGF.	
Functions of Random Variables	1.5
The CDF technique, transformation of random variables, sums of random variables; order statistics.	
Limiting Distributions	1
Definition of limiting distributions, Proof(s) of Central Limit Theorem; Asymptotic normal distributions.	
Tests	1
Total	**14**

Evaluation

Quizzes	15%
Homework	15%
Tests	40%
Final Exam	30%

- Graduate students will be assigned special homework/test problems or projects.

- Clear descriptions of thought processes, evidence of critical thinking, and effective communication must be demonstrated in written work.

- **Writing Across the Curriculum:** Students will be expected to communicate mathematics and mathematical ideas effectively in speech and writing. At the University Writing Center, trained consultants are ready to help you at any stage of the writing process. In addition to the important writing instruction that occurs in the classroom and during professors' office hours, the Center offers another site for learning about writing. **All students are encouraged to make use of these important services.**

- **NOTE:** Once a student has received credit, including transfer credit, for a course, credit may not be received for any course with material that is equivalent to it or is a prerequisite for it.