Salisbury University Department of Mathematical Sciences
MATH 414/514 : Mathematical Statistics II
Syllabus (Tentative)

Description: Methods of estimating, properties of estimator, hypothesis testing, linear models, least squares, analysis of variance, enumerative data, nonparametric statistics. 4 Hours Credit: Meets four hours per week.

Prerequisites: C or better in MATH 413.

Intended Audience: Students in Mathematics or Physical Sciences.

Objective: To learn how to construct and compare statistical estimators with an emphasis on proofs, formal reasoning and communicating mathematics in writing. In particular, introduce how statistics supports the theory of inference.

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

Topic	Weeks
Limiting distributions - Chapter 7	1.5
Sequences of random variables, further study of the central limit theorem, asymptotic normal distributions.	
Sampling Distributions - Chapter 7	1.5
Linear combinations of Normal random variables, the Chi-Square distribution, the t, F, and beta distributions, derivations and proofs of such distributions.	
Point estimation - Chapter 8,9	3
Method of moments, maximum likelihood estimation, criteria for evaluating estimators (UMVUE, CRLB, relative efficiency, consistency), and development of proofs to show that estimators have such properties. Bayes and minimax estimators	
Sufficiency and Completeness - Chapter 9	1
Sufficient statistics, and properties, complete statistics, exponential class	
Interval Estimation - Chapter 8	2
Confidence intervals, development of confidence intervals through pivotal quantities, One and two sample problems, Bayesian interval estimation	
Testing - Chapter 10	2
Tests for normal distribution, significance level and power of the test, Neyman-Pearson Lemma, Likelihood Ratio Tests, Uniformly most powerful tests, applications selected from classical tests	
Categorical Data and Nonparametric - Chapter 14,15	2
Chi-Square Tests, Simpson's Paradox, robust estimation, sign and rank	
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.