

STATISTICS 561
THEORY OF STATISTICS I
Fall 2016

Instructor: Erdogan Gunel, Professor
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Office Hours: MW 1:30 PM - 2:15 PM or by appointment.

This course is an introduction to probability and mathematical statistics with emphasis on theory. It is suitable for mathematically qualified graduate students who had three semesters of calculus courses.

Text: Introduction to Mathematical Statistics, Robert V. Hogg, Joseph W. McKean & Allen T. Craig. *Sixth Edition*.

Exams: There will be three exams. Each exam will be based on the topics which were covered since the previous exam. All exams are closed book but you may bring one page of notes. The notes however cannot have solutions of any problems.

Schedule of exams: 1st exam- Wednesday, September 21
2nd exam- Wednesday, October 26
3rd exam- Tuesday, December 13, 11:00 AM-1:00 PM.

You must take the exam on the day of the scheduled date. Make-up exams will not be given unless there is a legitimate reason for the absence and I am notified before the exam. In the case of an emergency situation, I must be notified within two days of the exam.

Exercises & Lecture Notes: You can obtain my lecture notes and solutions of exercises from WVU eCampus. The exercises are listed with the topics to be covered. You should first solve the exercises on your own and then compare them with my solutions.

Disability: If you are a learning, sensory or physically disabled student and feel that you need special assistance in regard to lectures, reading assignments, or testing, please advise me and make appropriate arrangements with Disability Services (293-6700).

Grading	Exam 1	33%
	Exam 2	33%
	Exam 3	34%

Academic Honesty: The WVU Catalog states:

“Cheating and dishonest practices in connection with examinations, papers, and projects, including but not limited to:

- a. Obtaining help from another student during examinations.
- b. Knowingly giving help to another student during examinations, taking an examination or doing academic work for another student, or providing one’s own work for another student to copy and submit as his/her own.
- c. The unauthorized use of notes, books, or other sources of information during examinations.
- d. Obtaining without authorization an examination or any part thereof”

The following topics will be covered:

Ch 1. Probability and Distributions

- 1.1 Introduction
- 1.2 Set Theory
- 1.3 The Probability Set Function
- 1.4 Conditional Probability and Independence
- 1.5 Random Variables
- 1.6 Discrete Random Variables
 - 1.6.1 Transformations
- 1.7 Continuous Random Variables
 - 1.7.1 Transformations
- 1.8 Expectation of a Random Variable
- 1.9 Some Special Expectations
- 1.10 Important Inequalities.

Exercises: 1.2.11, 1.2.16, 1.3.3, 1.3.6, 1.3.8, 1.3.10, 1.3.13, 1.3.14, 1.3.16, 1.3.18, 1.3.19, 1.4.6, 1.4.8, 1.4.12, 1.4.14, 1.4.18, 1.4.30, 1.5.1, 1.5.2, 1.5.3, 1.5.4a, 1.5.4b, 1.5.8, 1.6.1, 1.6.7, 1.6.8, 1.7.1, 1.7.3, 1.7.6, 1.7.21, 1.7.22, 1.7.24, 1.8.4, 1.8.6, 1.8.8, 1.8.9, 1.9.2, 1.9.4, 1.9.6, 1.9.8, 1.9.9, 1.9.16, 1.9.18, 1.9.19, 1.10.2, 1.10.3, 1.10.6

Ch 2. Multivariate Distributions

- 2.1 Distributions of Two Random Variables
 - 2.1.1 Expectation
- 2.2 Transformations: Bivariate Random Variables
- 2.3 Conditional Distributions and Expectations

- 2.4 The Correlation Coefficient
- 2.5 Independent Random Variables
- 2.6 Extension to Several Random Variables
 - 2.6.1 Variance-Covariance **(OMIT)**
- 2.7 Transformations: Random Vectors

Exercises: 2.1.7, 2.1.9, 2.1.10, 2.2.1, 2.2.3, 2.2.6, 2.3.2, 2.3.3, 2.3.10, 2.3.12, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.3, 2.5.6, 2.5.9, 2.6.3, 2.6.4, 2.6.6, 2.7.1, 2.7.2, 2.7.3, 2.7.4

Ch 3. Some Special Distributions

- 3.1 The Binomial and Related Distributions
- 3.2 The Poisson distribution
- 3.3 The Gamma, Chi-Square and Beta Distributions
- 3.4 The Normal Distribution
 - 3.4.1 Contaminated Normals **(OMIT)**
- 3.5 The Multivariate Normal Distribution **(OMIT)**
(Bivariate Normal Distribution will be discussed)
- 3.6 t and F-Distributions
 - 3.6.1 The t-distribution
 - 3.6.2 The F-distribution
 - 3.6.3 Student's Theorem
- 3.7 Mixture Distributions

Exercises: 3.1.1, 3.1.3, 3.1.5, 3.1.10, 3.1.16, 3.1.22, 3.1.25, 3.2.1, 3.2.2, 3.2.4, 3.2.8, 3.2.15, 3.3.1, 3.3.2, 3.3.4, 3.3.16, 3.3.20, 3.4.3, 3.4.4, 3.4.5, 3.4.6, 3.4.12, 3.4.13, 3.4.20, 3.4.28, 3.4.32, 3.5.2a, 3.5.2b, 3.5.5, 3.6.2, 3.6.8, 3.6.9, 3.6.10, 3.6.12, 3.6.13, 3.7.4, 3.7.6

Ch 4. Unbiasedness, Consistency, and Limiting Distributions

- 4.1 Expectations of Functions
- 4.2 Convergence in Probability
- 4.3 Convergence in Distribution
 - 4.3.1 Bounded in Probability **(OMIT)**
 - 4.3.2 Delta Method **(OMIT)**
 - 4.3.3 Moment Generating Function Technique
- 4.4 Central Limit Theorem

Exercises: 4.1.5, 4.1.6, 4.1.10, 4.1.14, 4.1.26, 4.1.27, 4.2.3, 4.3.2, 4.3.4, 4.3.7, 4.3.8, 4.3.11, 4.4.2, 4.4.3, 4.4.6, 4.4.7