

Math 441: Mathematical Statistics I

Course Syllabus

Fall 2008

Contact Information:

Instructor: Solomon W. Harrar, Ph.D.
Office Hours: MW 11:00-12:00 or by Appointment
Office: Math 012
Tel: (406)243-5562
Email: harrar@mso.umt.edu

Class Time and Place: MWF 10:00-11:00 AM, Math 108

Course Objectives: A prime objective of the Math 441-442 course sequence is to present techniques and basic results of probability and mathematical statistics at a rigorous and advanced calculus level.

In Math 441, we develop the probabilistic tools and language of mathematical statistics. The course describes probabilistic models for and properties of random variables and vectors, moments and common probability distributions. In the second semester course, Math 442, the structure of statistical inference procedures is studied. In particular, the theory of estimation, confidence sets and hypothesis testing for common parametric models are investigated.

Students taking the course must have completed a year long course in calculus and had some exposure to basic probability and statistics. Math 441-442 is a required sequence for Master's and PhD students majoring in mathematics with statistics emphasis.

Learning Goals: as stated in the Department of Mathematical Sciences assessment document.

- To understand the axiomatic approach to probability, counting and combinatorial methods, and Bayes' Theorem.
- To understand random variables and their properties, including marginal and conditional distributions, expectation, conditional expectation, covariance and correlation, moment generating functions, and distributions of functions of one or more random variables.
- To recognize and learn the properties of important probability distributions.
- To gain the ability to prove results in probability.
- To use statistical software to simulate random phenomena and to carry out probability computations for standard distributions.

Course Content: In Math 441, we shall cover most, but not all of the material in chapters 1 through 5 of the text book and additional materials from other sources.

1. *Probability Theory:* Sections 1.1-1.10, 2.1-2.3
2. *Random Variables and Distributions:* Sections 3.1-3.3
3. *Functions of Random Variables:* Section 3.8
4. *Expectations:* Sections 4.1-4.5
5. *Special Families of Distributions:* Sections 5.1-5.6, 5.9, 5.10
6. *Random Vectors:* Sections 3.4-3.7, 3.9, 4.6, 4.7, 5.11, 5.13

Prerequisite: Math 251 (multivariable calculus), Math 305, and Math 341 (Probability) or

Consent of the instructor.

Required Text:

- DeGroot and Schervish, Probability and Statistics, Third Edition, Addison Wesley 2001.

References (*Available in the library*):

- Hogg, McKean and Craig, Introduction to Mathematical Statistics, Sixth Edition, Prentice Hall 2005.

Grading Policy:

- Homeworks (10%)
- 3 Mid Terms (60 %)
- Cumulative Final Exam (30 %)

Grading Scale:

90-100 → A, 80-89 → B, 70-79 → C, 60-69 → D, 0-59 → F

Important Dates:

Mid Terms: September 19, October 17 and November 14

Final Exam: December 11, 2008 from 8-10 AM.

Homework: Homework will be assigned almost every class day. Only some of them will have to be turned in. Some of the homework problems may be based on materials that are discussed in the book but not directly treated in class. I will begin each day's class by going over some of the homework problems from the previous day. In the interest of time, we may not be able to entertain all the problems you would like to see done in class. However, I will be more than happy to assist you during office hours or by setting up an appointment.

Make Up: If you can not make it to an in class exam due to a documentable reason, please let me know as soon as possible. Make up will not be allowed for home works. However, I will double count your previous or future graded assignments in the cases of excused absences.

Attendance: I expect you to attend class regularly. However, attendance and class participation will have only the obvious indirect bearing on your course grade. However, in the event that a student has to miss a class, he/she is responsible to get caught up with the materials covered and homework assigned.

Disability: Students with disabilities are welcome to discuss accommodations with me.

Student Code: All students need to be familiar with the Student Conduct Code. You can find it in the "A to Z Index" on the UM home page.

Academic Honesty: All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University.