

CENTRAL WASHINGTON UNIVERSITY  
Mathematics 411A, Introduction to Probability  
Fall, 2008

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## OVERVIEW OF COURSE

### OVERALL COURSE OBJECTIVES:

The major objectives of this course are to help students:

1. Gain the knowledge and ability to work with probability, conditional probability, random variables, density and distribution functions, and expectation.
2. Learn to formulate and solve probability related problems.

### Student Outcomes:

At the conclusion of this course, the student will be able to:

1. Solve basic "counting" problems.
2. Understand and apply the axiomatic approach to probability theory.
3. Understand independence, find conditional and unconditional probabilities and apply Bayes' Theorem.
4. Apply all the standard discrete and continuous probability distributions.
5. Understand and calculate mathematical expectations for random variables and functions of random variables.

### COURSE MATERIALS REQUIRED:

Irwin Miller and Marylees Miller, John E. Freund's Mathematical Statistics with Applications, 7th Edition (Prentice-Hall), 2004. Chapters 1-5 will be covered.

**Advance reading** of the problems and text material is essential to good performance in this course. This textbook is particularly easy to read, and that is the main reason for its choice. There are a number of difficult topics, however, and I will supplement the material with handouts, discussions, and examples. The course is demanding---far more so than Math 311, for example. Advice from previous students is: "If you want to do well, *go to class every day, study your notes, and do not fall behind.*"

<b>COURSE POINTS:</b>		
	<b>POB</b> Problems Presented	50 points
	<b>HOW</b> Problems Handed in	50
points	Chapter Tests (Four)	200 points
	Final Exam	100 points
	<hr/> Total	<hr/> 400 points
The final exam is cumulative.		

**Grading:** You will have several ways of earning points:

1. **HOW**---or Homework Of the Week. The book exercise problems that are assigned should be worked. Although I will not grade all for you, I will ask for *specific problems* to be turned in, including several that may be derived from class discussion. We will have five **HOW's** worth 10 points each. You will have a minimum of three days to work on **HOW** problems. For example, if assigned on Friday, the due date would be Monday at the earliest.

2. **POB**---or Problems On the Board. To facilitate learning from peers and ensure that most of you got a good handle of exercise problems before each chapter quiz, you will have opportunities to choose one or two, depending on the available exercises, assigned exercise problems to present on the board during the progression of each chapter. Problems presented will earn you full credits unless there is serious error(s). You are very welcome to check with me your solutions before your presentation. It's by First Come First Served basis---Since the same problems presented by a student before cannot be presented again, early presenters have more freedom on choosing problems he/she would like to present.

3. **Four 50- points Chapter Tests:** To strongly encourage you to go over the material and problems you have just been exposed to in each chapter, we will have four 45-minute Chapter Tests, each of which will count 50 points. You will find the test problems similar to the assigned text problems and examples/concepts I have emphasized in class.

4. **A two-hour final:** It can comprise of one-hour take home and one-hour in-class exam or just a 2-hour in-class final exam. They will be given as scheduled in the final exam week.

5. **Bonus Point(s):** By asking or answering an excellent/important question related to class material, or by maintaining great quality for **HOW's** or **POB's**, students will be awarded one or two bonus points occasionally throughout the fall quarter to help enhance their grade.

There MAY be another item or two, such as a group project. More on this later.

**Text Problems Assigned:**

**Chapter 1:** 1, 11, 14, 23, 24, 25, 30-32, 38-40, 41, 43, 45

**Chapter 2:** 2, 7, 13, 16, 23, 26, 27, 36, 39, 42, 43, 45, 46, 48, 66, 68-70, 75, 76, 80, 83-93, 98-101, 103

**Chapter 3:** 1-5, 11-13, 16-19, 24-32, 34-43, 45, 46, 49-59, 61, 63-65, 67, 68, 84, 86, 87, 89-91, 94-97, 102, 107-109

**Chapter 4:** 17, 18, 20-22, 25-27, 30-32, 41, 43, 48, 50, 54, 55, 57-60, 62, 64-66, 68, 69, 76-78, 83

**Chapter 5:** 3, 16-21, 26, 27, 37, 38, 40, 55-59, 61, 62, 64, 66, 71-73, 75, 83-85

<b>LEVEL OF AWARENESS ISSUES INCORPORATED IN THIS COURSE:</b>				
<b>AWARENESS ISSUE</b>	<b>-----ACTIVITY LEVEL-----</b>			
	<b>NONE</b>	<b>LOW</b>	<b>MODERATE</b>	<b>HIGH</b>
Graphical Data Display		*		
Data/Information Sources		*		
Interpret Information				*
Mathematical Proof			*	
Probability Principles				*
Solving Problems				*

### **SCHEDULE OF CLASS TOPICS AND ASSIGNMENTS**

A tentative list of timing of topic coverage and chapter tests is presented below. Due to the intensive nature of the course, and possible variability in student backgrounds and learning process, we may deviate from this schedule. Please pay attention to the announcements.

<u>Week</u>	<u>Section</u>	<u>Topic</u>
1		<b>(Introduction)</b>
Sept.24	1.1~1.4	• Combinatorial Methods
--Sept.26		• Binomial Coefficients
		<b>(Probability)</b>
2		
Sept. 29	2.1~2.6	• Sample Spaces

- Oct.3
- Events
  - Probability of An Event
  - Rules of Probability
  - Conditional Probability

- 3  
Oct.6            2.7-2.9
- Oct.10
- Independent Events
  - Bayes' Theorem.

<b>Oct. 10</b>	<b>Chapter Test 1</b>	<b>(50 points)</b>
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- 4
- Oct.13            3.1~3.4
- Oct.17
- (Probability Distributions)**
- Probability Distributions
  - Continuous Random Variables
  - Probability Density Functions

- 5
- Oct. 20            3.5~3.6
- Oct.24
- (Probability Densities)**
- Multivariate Distributions
  - Marginal Distributions

- 6
- Oct. 27            3.7~3.8
- Oct.31
- Conditional Distributions

<b>Oct. 31</b>	<b>Chapter Test 2</b>	<b>(50 points)</b>
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- 7
- Nov.3            4.1~4.5
- Nov.7
- (Mathematical Expectation)**
- Expected Value of a Random Variable
  - Moments
  - Chebyshev's theorem
  - Moment Generating Functions

8  
 Nov.10 4.6~4.9  
 --Nov.14

- Product Moments
- Moments of Linear Combinations of Random Variables
- Conditional Expectations

9  
 Nov.17  
 --Nov.21

<b>Nov. 20</b>	<b>Chapter Test 3</b>	<b>(50 points)</b>
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***THANKSGIVING!!!***

10  
 Nov. 24 5.1~5.7  
 --Nov.28

**(Special Probability Distributions)**

- Discrete Uniform Distribution
- Bernoulli Distribution
- Binomial Distribution
- Negative Binomial and Geometric Distributions
- Hypergeometric Distribution

11  
 Dec.1 5.8~5.10  
 --Dec.5

- Poisson Distribution
- Multinomial Distribution

<b>Dec. 5</b>	<b>Chapter Test 4</b>	<b>(50 points)</b>
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12  
 Dec.8  
 --Dec.12

***FINAL EXAM!!***

### **TEST POLICY**

Because of the timely nature of the tests, no make-ups will be given. A grade of zero will be assigned unless you contact me **before** the scheduled time and provide an acceptable excuse. A weighted average of your score on the remaining tests will be used for the missing score. Final examination policy is as established by the Dean of Students.

## **HOMEWORK POLICY**

Homework will be assigned and collected. Working on exercises and homework is the only way most of us learn to critically analyze and ``solve" problems.

Some class time will be devoted to questions on the exercises and homework. Office hours are also scheduled to provide opportunities for more in-depth discussion of homework problems.

Your homework must be well **stapled** and written/printed on **flat papers**. Failing to do any one of the above will result in losing homework points.

No late homework will be accepted unless you contact me and provide an acceptable reason.