George Mason University
The Volgenau School of Information Technology and Engineering
Department of Statistics

# STAT 544: Applied Probability

Fall Semester, 2008
Thursdays from 7:20 pm – 10:00 pm
Location: Science and Technology I 120

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**Instructor: Larry Tang**
Email: ltang1@mail.gmu.edu
Phone: 703-993-9111
Office Hours: 5:00 pm - 6:30 pm on class days and by arrangement
Office Location: Science & Technology II Room 155

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**Required Text:**

- *A First Course in Probability, 7th ed.*, Sheldon Ross, Prentice-Hall, 2006, ISBN 0-13-185662-6.

**Description:**

This course presents the mathematical framework of applied probability theory. It is a calculus-based course with emphasis on developing probability concepts and problem solving skills with applications in computer science, engineering, operations research, and statistics. Topics covered include combinatorics, probability axioms, conditional probability and independence, random variables, expectation, moment generating functions, transformations of random variables, special discrete and continuous distributions, jointly distributed random variables, sums of random variables, and limit theorems.

This course builds on the probability concepts studied at the undergraduate level, with more emphasis placed on advanced topics and derivations of key results. The course material will become increasingly difficult as the semester progresses.

**Prerequisite:**

MATH 213 and STAT 344

**Class requirements:**

- *Lectures.* Lectures are critical for the understanding of the material. There will be some material and homework that will not be from either textbook, and so there will be no way to do well in the class without attending and understanding lecture materials. It is assumed that students will take careful notes in class.

- *Homework.* Homework #0 is a "pretest" to make sure that you have the basic mathematical skills that are necessary for this course. This assignment will be graded, but the score will not count toward your course grade. You should work independently on this assignment, so you and I can assess your background and skills.

  Homework will be assigned weekly. One week will be given to finish the homework. Homework will be collected before class on the due date. **No late homework will be allowed except under very unusual circumstances.** You are encouraged to discuss homework problems with one another or work in groups. However, you should write your solutions independently. Duplicating others' homework constitutes a violation of the university academic integrity policy.

  The homework should be neat with the pages stapled together in the upper left corner. The problems should be in sequential order. Answers should be circled. Only paper copies will be accepted – no emails or faxes.

- *Weekly Quizzes*. There will a 10-point quiz every class except on exam days, for a total of 11 quizzes. Second chances will be given on quizzes. Retakes must be before the next class period and the two grades will be averaged. Quizzes may not be rescheduled. (If you miss a quiz, you can "retake" it and your score will be averaged with a zero).

- *Final Concept Quiz*. There will be a 50-point in-class cumulative concept quiz on the last class.

**Grading:**

- 25% for homework assignments
- 25% for quizzes
- 25% for midterm exam
- 25% for final exam

Exception: by GMU policy, any student who does not take the in-class final exam will receive a grade of 'S/A' (stopped attending), which becomes an F on their transcript, regardless of their points earned.

**Additional Comments:**

- Put **STAT 544** in the subject line when you send me e-mail
- You are expected to familiarize yourself with the George Mason University honor code and abide by it
- You are expected to take the exams during the designated time slot; Incompletes will not be granted except under *very* unusual circumstances

**Temporary Class Schedule:**

| WK | Date | Lecture Topics | | Chapter | HW | Notes |
|---|---|---|---|---|---|---|
| 1 | Aug-28 | ***Syllabus:*** | Syllabus, Textbooks, | 2.1-2.5<br>1.1-1.5 | | |
| | | ***General Topics:*** | Review of Set Theory, Sample Spaces and Events, Probability Axioms and Laws | | | |
| 2 | Sep-4 | Counting Techniques | | 1.1-1.5 | | |
| 3 | Sep-11 | Conditional Probability and Independence | | 3.1-3.5 | | |
| 4 | Sep-18 | Discrete RVs: PMF, CDF, Probability, transformation of RV, Expected Value | | 4.1-4.3, 4.9 | | |
| 5 | Sep-25 | Mean, Variance, Standard Deviation; Properties of Expectation; Markov's, Chebyshev's, and Jensen's Inequalities; Moments and Moment Generating Function | | 4.4-4.5, 8.2, 8.5, 7.7 | | |
| 6 | Oct-2 | Special Discrete Distributions | | 4.6-4.8, 7.7 | | |
| 7 | Oct-9 | Continuous RVs: pdf, CDF, Probability, Expectation, MGF; Uniform and Exponential Distributions | | 5.1-5.3, 5.5, 7.7 | | |
| ** | Oct-16 | **Midterm Exam** | | | | |
| 8 | Oct-23 | Univariate Transformations; Gamma, and Beta Distributions | | 5.6-5.7, 7.7 | | |
| 9 | Oct-30 | Normal Distribution; Joint Distributions: Joint/Marginal PMF and pdf, CDF, MGF; Probability, Expectation, Covariance | | 5.4, 6.1-6.2, 7.1-7.2,7.4, 7.7 | | |
| 10 | Nov-6 | Conditional Distributions, Probability, | | 6.4-6.5,7.5-7.6 | | |
| 11 | Nov-13 | Multivariate Distributions; Bivariate-to-univariate and Bivariate-to-bivariate Transformations | | 6.7 | | |
| 12 | Nov-20 | Sums of Independent Random Variables, Weak Law of Large Numbers, Central Limit Theorem | | 6.3, 7.2, 7.4, 7.7, 8.2, 8.3 | | |
| 13 | Dec-4 | Review, Evaluations, Final Concept Quiz | | | | |
| ** | Dec-11 | **Final Exam** | | | | |