Introduction to Probability

Math 30530 Section 01

Fall 2013

Probability deals with occurrences that have some degree of randomness in their outcomes; in other words, just about everything, from calculating how likely it is that you win the lottery, to estimating how much longer until your computer's hard-drive goes kaput. The mathematical study of probability creates a language and a framework within which we can talk sensibly about random phenomena, and make realistic predictions about them.

About the course

- **Official course description**: An introduction to the theory of probability, with applications to the physical sciences and engineering. Topics include discrete and continuous random variables, conditional probability and independent events, generating functions, special discrete and continuous random variables, laws of large numbers and the central limit theorem. The course emphasizes computations with the standard distributions of probability theory and classical applications of them.

- **Course content**: We will go through all of chapters 1, 2, 3 and 5 of the course textbook, and some of chapters 4 and 6.

- **Objectives**: At the end of the semester, you will be able to

    - Define and distinguish between the basic objects of probability theory;
    - Compute the probability of events, given appropriate probability distributions;
    - Model the occurrence of events using appropriate probability distributions;
    - Apply the Central Limit Theorem when estimating probability distributions and determining sample size;
    - Prove facts from probability requiring techniques from calculus (i.e. series convergence and integration).

    More generally, this course will prepare you for basic applications of probability theory including mathematical statistics and notions of randomness.

General Arrangements

- **Instructor**: David Galvin, 248 Hayes-Healy, `dgalvin1@nd.edu`. Feel free to email me anytime. I try to respond quickly to any question or comments.

- **Office hours**: Initially Tuesdays, 5.00pm-6.00pm and Thursdays, 3.00pm-4.00pm. Also, meeting times outside my office hours can be arranged by emailing me – I have free hours most days of most weeks.

- **Lectures**: MWF 2.00pm-2.50pm, De Bartolo 215, August 28 – December 11.

- **Text**: *Introduction to Probability (2nd ed)* by Dimitri P. Bertsekas & John N. Tsitsiklis, published by Athena Scientific (`http://www.athenasc.com`), ISBN 978-1-886529-23-6.

- **Course website**: `http://www.nd.edu/~dgalvin1/30530/30530_F13/index.html`, where homework, handouts and quiz and exam solutions will be posted. (NB - when following this link straight from a pdf file of the general arrangements, the tilde in front of `dgalvin1` sometimes causes a problem; if so just enter it by hand.)

- **Sakai**: `http://sakai.nd.edu/`. This is where grades will be posted.

Course work

- **Homework**: Homework will be announced most Fridays and posted on the course website. It will be due at the beginning of class the following Friday. Each assignment will involve some reading and some problems, possibly on an area not yet covered in lectures. Presented assignments should be neat and legible. At the top of the first page, you should write your name, the course number and the assignment number. If you use more than one page, you should staple all your pages together. The grader reserves the right to leave ungraded any assignment that is disorganized, untidy or incoherent. Your homework assignments count (equally weighted) for 100 out of 550 points of your final mark. No late assignments will be accepted. It is permissible (and encouraged) to discuss the assignments with your colleagues; but the writing of each assignment must be done on your own.

- **Quizzes**: Roughly every second Wednesday there will be a quiz in class, on material covered in the previous three lectures. Your quizzes count (equally weighted) for 100 points out of 550.

- **Exams**: There will be two in-class midterms (tentatively on October 14 and November 22) and a (cumulative) final on Wednesday, December 18, from 1.45pm to 3.45pm. Specific exam policies (such as format, which sections will be covered, . . .) will be announced in class closer to the time. Each midterm will count for 100 points out of 550, and the final will count for 150 points out of 550.

- **Final grade**: A 92% average will earn you an A overall; an 80% average a B; and a 65% average a C.

- **Grading disputes**: If you have any issue with the grading of your weekly assignments or with your midterm exams, you must let me know (in writing; email is fine) within seven days of receiving the work back; otherwise I can't promise that I can consider the issue.

Conduct

- **Honor code**: You have all taken the Honor Code pledge, to not participate in or tolerate academic dishonesty. For this course, that means that although you may (and should) discuss assignments with your colleagues, you must write the final version of each of your assignments on your own; if you use any external sources to assist you (such as other textbooks, computer programmes, etc.), you should cite them clearly; your work on mid-semester exams and the final exam should be your own; and you will adhere to all announced exam policies.

- **Class conduct**: The lecture room should be a place where you should feel free to engage in lively discussion about the course topic; don't be shy! But interruptions not related to the course should be kept to a minimum. In particular, you should turn off or switch to silent all phones, etc., before the start of class. If for some good reason you need to have your phone on during class, please mention it to me in advance.