Mt00402 Finite Probability
Summer 2013, 3 Credits

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Office Hours: Tuesday, 11:30 - 1
Thursday, 11:30 - 1 (weeks 1, 2, 3, 5)
Monday 3:30 - 5 (week 3, July 8)
Wednesday 3:30 - 5 (weeks 4, 6)
Telephone: 617-552-3771
Schedule: Tuesday, Thursday 8:30 - 11:30 am
Room: Fulton 110
Instructor Web Page: https://www2.bc.edu/ned-rosen/

Boston College Mission Statement

Strengthened by more than a century and a half of dedication to academic excellence, Boston College commits itself to the highest standards of teaching and research in undergraduate, graduate and professional programs and to the pursuit of a just society through its own accomplishments, the work of its faculty and staff, and the achievements of its graduates. It seeks both to advance its place among the nation's finest universities and to bring to the company of its distinguished peers and to contemporary society the richness of the Catholic intellectual ideal of a mutually illuminating relationship between religious faith and free intellectual inquiry.

Boston College draws inspiration for its academic societal mission from its distinctive religious tradition. As a Catholic and Jesuit university, it is rooted in a world view that encounters God in all creation and through all human activity, especially in the search for truth in every discipline, in the desire to learn, and in the call to live justly together. In this spirit, the University regards the contribution of different religious traditions and value systems as essential to the fullness of its intellectual life and to the continuous development of its distinctive intellectual heritage.

Course Description

This course is a survey of applied finite probability, including finite sets and partitions, enumeration, sample spaces, expectation and random variables. It includes a brief introduction to statistics.

Course Objectives

1. The student will demonstrate knowledge across cultural settings and will learn the impact of culture, gender, and age in political propaganda as demonstrated by understanding the impact of ambiguous language in presenting statistical arguments.
2. The student will demonstrate ethical knowledge pertaining to media sensationalism as demonstrated by applying Bayesian methods to correctly interpret probabilistic claims in areas like political polling and medical testing.

3. The student will demonstrate skill in representing and solving enumeration problems which involve Boolean set operations, permutations, and combinations. These skills will be acquired through practice on homework problems in Chapter 5.

4. The student will demonstrate skill in evaluating probabilities of events for finite and abstract sample spaces, including conditional and Bayesian probabilities. These skills will be acquired through practice on homework problems in Chapter 6, which involve applying the methods of Ch. 5 to probability as well as the use of tree diagrams to represent conditional probability.

5. The student will demonstrate skill in representing data sets and finite random variables, as well as computing expectation, variance and standard deviation. The binomial and normal distributions, and the relationship between them, will be included among these random variables. These skills will be acquired through practice on homework problems in Chapter 7.

**Grading**

- Homework 100 points
- Exams 200 points (2 x 100)
- Final Exam 200 points
- TOTAL 500 points

Your point total (out of 500) is divided by 5 to give you a course average between 0 and 100. Letter grades will be assigned to these averages. The minimum curve is:

\[
50 \leq \text{D’s} \rightarrow 60 \leq \text{C’s} \rightarrow 75 \leq \text{B’s} \rightarrow 88 \leq \text{A’s} \rightarrow 100
\]

but it may be more generous than that.

**Summer Grading System**
The undergraduate grading system consists of twelve categories: A (4.00), A- (3.67), excellent; B+ (3.33), B (3.00), B- (2.67), good; C+ (2.33), C (2.00), C- (1.67), satisfactory; D+ (1.33), D (1.00), D- (.67), passing but unsatisfactory; F (.00), failure; I (.00), incomplete; F (.00), course dropped without notifying office; W (.00), official withdrawal from course. The graduate grading system is A (4.00), A- (3.67), Excellent; B+ (3.33), B (3.00), good; B- (2.67), C (2.00), passing but not for degree credit; F (.00), failure.

**Grade Reports.** All students are required to log into the web through Agora to access their summer grades. Students must utilize their BC username and password to log on. If your username or password is not known, the HELP Desk located in the Campus Cell...
Technology Resource Center (CTRC) in O’Neill Library will issue a new one. The CTRC requires a valid picture ID (a BC ID, driver’s license or passport) to obtain your password.

**Text(s)/Readings (Required)**


You will also need to purchase an access code for WebAssign for approximately $25, for which you will need a credit card.

**Text(s)/Readings (Recommended)**

God Plays Dice ([http://gottwurfelt.wordpress.com](http://gottwurfelt.wordpress.com)) is a light-hearted blog about probability. Please check it out for some fascinating applications of the course material in today's world.

**Important Policies**

[http://www.bc.edu/content/bc/schools/advstudies/guide/academicinteg.html](http://www.bc.edu/content/bc/schools/advstudies/guide/academicinteg.html)

**Homework**

We will be using WebAssign online system for the graded homework. The assignments are on line, are tied to the specific sections of the textbook, and have a due date and time. A separate handout will show you how to get started in WebAssign. Use the link on the course web page to get there the first time. Additional practice problems from the text, whose answers are in back of the text, will also be assigned (the practice problems are found on the course web page). The practice problems are not collected nor graded.

The WebAssign Class Key for this section is **bc 4271 6719**

**Exams:** Two hour exams, dates indicated below. On each exam you may use one page of prepared notes (both sides), a calculator, and pens/pencils.

**Final exam:** Thursday August 1. You may use three sheets of notes for the final.

**Scholarship and Academic Integrity**

It is expected that students will produce original work and cite references appropriately. Failure to reference properly is plagiarism. Scholastic dishonesty includes, but is not necessarily limited to, plagiarism, fabrication, facilitating academic dishonesty, cheating on examinations or assignments, and submitting the same paper or substantially similar papers to meet the requirements of more than one course without seeking permission of all instructors concerned. Scholastic misconduct may also involve, but is not necessarily limited to, acts that violate the rights of other students, such as depriving another student of course materials or interfering with another student’s work.
Request for Accommodations
If you have a disability and will be requesting accommodations for this course, please register with either Dr. Kathy Duggan (dugganka@bc.edu), Associate Director, Connors Family Learning Center (learning disabilities or AHD) or Dean Paulette Durrett, (paulette.durrett@bc.edu), Assistant Dean for students with disabilities, (all other disabilities). Advance notice and appropriate documentation are required for accommodations.
http://www.bc.edu/content/bc/libraries/help/tutoring/specialservices.html.

Attendance
Students are expected to attend all classes and to arrive by the beginning of and remain for the entire class period. When an occasion occurs that prevents a student from attending class, it is the student’s obligation to inform the instructor of the conflict before the class meets. If a student misses a class, he or she is responsible for making up the work by obtaining a classmate's notes and handouts and turning in any assignments due. Types of absences that are not typically excused include weddings, showers, vacations, birthday parties, graduations, etc. Additional assignments, penalties and correctives are at the discretion of the instructor. If circumstances necessitate excessive absence from class, the student should consider withdrawing from the class. In all cases, students are expected to accept the decision of the instructor regarding attendance policies specific to the class.

Consistent with our commitment of creating an academic community that is respectful of and welcoming to persons of differing backgrounds, we believe that every reasonable effort should be made to allow members of the university community to observe their religious holidays without jeopardizing the fulfillment of their academic obligations. It is the responsibility of students to review course syllabi as soon as they are distributed and to consult the faculty member promptly regarding any possible conflicts with observed religious holidays. If asked, the student should provide accurate information about the obligations entailed in the observance of that particular holiday. However, it is the responsibility of the student to complete any and all class requirements for days that are missed due to conflicts due to religious holidays.

There may be circumstances that necessitate a departure from this policy. Feel free to contact the Summer Session Office at 617-552-3800 for consultation.

Deadlines
WebAssign Assignments are due as specified in the assignment. Late assignments are not accepted by the software.

Course web Site: http://www2.bc.edu/ned-rosen/mt004sum13
The web site contains the syllabus, a list of the practice problems, and a link to WebAssign. It will be active as of June 18, 2013.
**Course Schedule and Assignments** (readings, exercises and/or experiences)

It is expected that 11 hours per week of your study time out will be spent on out of class reading, homework assignments, practice problems, and exam preparation. The assignments and schedule are listed below. Please note that some weeks will require more time and some weeks less time but the average is approximately 11 hours per week over the six week semester.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Text Sections</th>
<th>Due 11:59pm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tu, 6/25</td>
<td>Set Operations, Venn Diagrams</td>
<td>5.1 - 5.3</td>
<td>Fri 6/28</td>
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<tr>
<td>Th, 6/27</td>
<td>Permutations, Combinations</td>
<td>5.4 - 5.5</td>
<td>Tu 7/2</td>
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<tr>
<td>Tu 7/2</td>
<td>Enumeration, Intro Probability</td>
<td>5.6, 6.2-3</td>
<td>Tu 7/9</td>
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<td>Th 7/4</td>
<td><em>NO CLASS</em>  JULY 4 HOLIDAY</td>
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<tr>
<td>Tu 7/9</td>
<td>ELO, review, <strong>EXAM 1</strong></td>
<td>6.3</td>
<td>Fri 7/12</td>
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<tr>
<td>Th 7/11</td>
<td>Conditional Probability, Independence</td>
<td>6.4,5</td>
<td>Tu 7/16</td>
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<tr>
<td>Tu 7/16</td>
<td>Trees, Bayesian Probability</td>
<td>6.6, 6.7</td>
<td>Mon 7/22</td>
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<td>Th 7/18</td>
<td>Review, <strong>EXAM 2</strong></td>
<td>none</td>
<td>no assignment</td>
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<tr>
<td>Tu 7/23</td>
<td>Data sets, RV's, Expectation</td>
<td>7.2, 4</td>
<td>Fri 7/26</td>
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<td>Th 7/25</td>
<td>Variance, Binomial RV, Std. Normal</td>
<td>7.5, 3, 6</td>
<td>Tues 7/30</td>
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<td>Tu 7/30</td>
<td>Normal Distribution, Approx. Binomial</td>
<td>7.6, 7.7</td>
<td>practice only</td>
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<tr>
<td>Th 8/1</td>
<td>Review, <strong>FINAL EXAM</strong></td>
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**Course content.**

Probability is the mathematics of uncertainty, and the main topic of this course — *finite probability*—refers to situations in which only a finite number of different outcomes can happen. In order to understand these situations, we first need to be able to count the number of different outcomes, and this topic (called *enumeration*) is the main idea in Chapter 5. Following that, Chapter 6 covers the basics of finite probability, and the final section of the course (Chapter 7) relates the probability we have learned to *statistics*, which is the study of data. Here is a simple, but striking, example of the ideas in this course:

Suppose (to be really generous to the NSA) that by wiretapping the phone conversations of someone, you can tell with 99.9% accuracy whether or not he or she is a terrorist, and let us estimate there are 2500 terrorists lurking out there among the 250 million adult phone users in the US. If a random person is identified from wiretapping as a terrorist, what are the chances that he or she really is a terrorist?

Did you say 99.9%? Most people would, but they’d be wrong. In fact, the correct answer is around 1% — 99 out of a 100 times a positive terrorist ID will be an innocent person! This example involves Baysian probability, one of the topics on Chapter 6.

How does this course compare to other BC math courses? In one sense, it is the easiest math core course since the technical math skills needed (e.g. solving equations, simplifying formulas, etc) are really minimal. On the other hand, most of the work involves story problems which must be read and understood before trying to solve — so in another sense, this course can be conceptually challenging since many parts of it can not be reduced to a sequence of automatic “steps.”
University Level Learning

This course may be your first taste of college mathematics. Our goal is more than having you reproduce what was told to you in the classroom; it is for you to acquire a command of the material, so that you can apply what you have learned to new situations.

It is your responsibility to learn the material; most of that learning takes place at home. Work with other students if you prefer. Or alone. But don’t expect to walk out of class with a full understanding of the material that takes work outside of class.

The instructors’ job is to provide a framework, with some of the particulars, to guide you in doing your learning at home. It is not to program you with isolated facts nor with step-by-step methods for doing specific types of exam problems. When rote practice occurs, it will be on the homework, not in class.

Read the textbook! It is very readable, but it is not a novel, so it must be read slowly, with pencil, paper, and calculator in hand. Work through examples and try to fill in any omitted steps. Read each section before the lecture covering it; the fast-paced lectures will make much more sense if you have absorbed some of the content upon a first reading. After the class, go back and read it again.

Extra Help: There is free tutoring available at the Academic Development Center in O’Neill Library. You must make an appointment at 617-552-8055.

If you are a student with a documented learning disability seeking reasonable accommodations in this course, please contact the Connors Family Learning Center (617-552-8093); regarding all other types of disabilities, please contact the Disability Services Office (617-552-3470).