Course Description: Probability spaces, discrete and continuous random variables, transformations, expectations, generating functions, conditional distributions, law of large numbers, central limit theorems.

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Office hours: 10-12pm Thu, location: 301 Thomas

Text: The first course in probability, 9th Edition. Most of chapters 1-8 will be covered.

Prerequisites: Fluency with elementary calculus (derivatives, integrals, etc).

Grade Distribution:
- Weekly Assignments 20%
- Midterm 1 (Oct. 2) 22%
- Midterm 2 (Nov. 6) 22%
- Final Exam 35%
- Participation 1%

Course Policies:

- General
  - Exams are closed book, closed notes. Where appropriate, I will provide formula sheets and tables.
  - No “make-up” exams will be given for ANY reason. Early exams might be allowed, with prior arrangement, for students with direct conflicts due to other required university programs (chess team, field trip, Blue Band trip, etc.,) and that program director must provide a letter requesting that you be excused from the exam at least one week ahead.
  - Students are responsible for all announcements and supplements given within any lecture. Class announcements and materials will be regularly posted on ANGEL, so it is recommended that you check the site frequently.

- Homework Assignments
  - There will be weekly homework assignments, due in class on Fridays.
– **No late homework will be accepted for any reason.** However, the lowest homework score will be dropped.

– I will not accept papers held together using some combination of folding and tearing the corner. Write your name on every page and use staples!

– The TA will carefully grade a subset of the assigned problems and scan the remainder to ensure that they are finished. The graded problems will be worth a total of 10 points, and completion of the ungraded problems will earn a total of 10 points. This makes each assignment worth 20 points all together.

– Assignments and solutions will be available on ANGEL.

– You are allowed and even encouraged to work with other students in the class. However, each student must turn in his/her own work, and in no case is it ever acceptable to simply copy directly from another person’s work.

– **Extra credit homework assignment** You will have an opportunity to earn up to 4% towards your overall course grade through extra credit assignments. The extra credit assignments will provide a review of the more challenging course content leading into each exam and will be due on Feb 17 (1% worth before the first midterm); March 30 (1% points worth before the second midterm); and April 29 (2% points worth before the final exam).

– There will be no homework assigned during the weeks the midterms occur as that is when the extra credit is due.

**Exams**

– There will be two midterm exams, each of which is worth 22% of the final grade. The midterm exams are scheduled on Friday Feb 19 and April 1.

– The final exam is comprehensive and represents 36% of the final grade.

**Final Grades** Tentative guideline for final grades:

A: 91-100%, A-: 88-90%, B+: 85-87%, B: 80-84%, B-: 77-79%

C+: 73-76%, C: 65-72%, D: 50-64%, F: 0-49%
### Tentative Course Outline

(This could change, depending on the progress of the class.)

<table>
<thead>
<tr>
<th>Week</th>
<th>Content</th>
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| Week 1   | • Basic combinatorics, set operations, sample spaces  
          | • Reading assignment: 1.1–1.5, 2.1–2.2 |
| Week 2 (HW1) | • Axioms of probability, conditional probability, independent events  
                   | • Reading assignment: 2.3–2.5, 3.1–3.2  
                   | • Martin Luther King Day holiday on Monday |
| Week 3 (HW2) | • Bayes’s theorem, more on conditional probability  
                     | • Reading assignment: 3.3–3.5 |
| Week 4 (HW3) | • Random variables, discrete r.v.s, expectations  
                     | • Reading assignment: 4.1–4.3 |
| Week 5 (HW4) | • More on expectations, variance, CDFs, discrete moment generating functions  
                      | • Reading assignment: 4.4–4.6 |
| Week 6 (extra credit) | • Bernoulli and Binomials r.v.s  
                               | • Midterm exam (Feb 19, Fri): Ross 1.1–1.5, 2.1–2.5, 3.1–3.5, 4.1–4.6. |
| Week 7 (HW5) | • Poisson, Geometric, Negative Binomial, Hypergeometric, others; expected values of sums  
                       | • Reading assignment: 4.7–4.9 |
| Week 8 (HW6) | • Continuous r.v.s, Uniform, Normal distributions  
                       | • Reading assignment: 5.1–5.4 |
| Spring break |         |
| Week 9 (HW7) | • Exponential, other continuous (e.g. Gamma, Weibull etc.); transformations  
                          | • Reading assignment: 5.4–5.7 |
| Week 10 (HW8) | • Joint distributions; independence, sums of independent r.v.s; conditional pmfs  
                             | • Reading assignment: 6.1, 6.2, 6.4 |
| Week 11 (Extra credit) | • Conditional pdfs, order statistics, multivariate transformations  
                                    | • Reading assignment: 6.5–6.7  
                                    | • Midterm exam (April 1, Fri): Ross 4.6–4.9, 5.1–5.7, 6.1, 6.2, 6.4 |
| Week 12 (HW9) | • Expectations of sums; covariances  
                           | • Reading assignment: 7.1–7.4 |
| Week 13 (HW10) | • Conditional expectations, law of iterated expectations  
                           | • Reading assignment: 7.5 |
| Week 14 (HW11) | • Limit theorems, Chebyshev’s inequality, Weak Law of Large Numbers, Central Limit Theorem  
                                  | • Reading assignment: 8.1–8.3 |
| Week 15 (HW12) | • Strong Law of Large Numbers, Inequalities  
                        | • Reading assignment: 8.4–8.5 |
| Week 16 | • Final exam (Comprehensive) |
Academic Integrity:

All Penn State and Eberly College of Science policies regarding academic integrity apply to this course. See http://www.science.psu.edu/academic/Integrity/Policy.html for details. In particular, on exams, each student must complete his/her own work without aiding or receiving aid from anyone else in any way. Examples of infractions that will result in disciplinary action are listed under "Categories of infractions" on the ECOS academic integrity page.

ECOS Code of Mutual Respect:

The Eberly College of Science Code of Mutual Respect and Cooperation (http://science.psu.edu/climate/code-of-mutual-respect-and-cooperation/Code-of-Mutual-Respect%20final.pdf) embodies the values that we hope our faculty, staff, and students possess and will endorse to make the Eberly College of Science a place where every individual feels respected and valued, as well as challenged and rewarded.

Penn State welcomes students with disabilities into the University’s educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Disability Services (ODS) at 814-863-1807 (V/TTY). For further information regarding ODS, please visit the Office for Disability Services Web site at http://equity.psu.edu/ods/. In order to receive consideration for course accommodations, you must contact ODS and provide documentation (see the documentation guidelines at http://equity.psu.edu/ods/guidelines/documentation-guidelines). If the documentation supports the need for academic adjustments, ODS will provide a letter identifying appropriate academic adjustments. Please share this letter and discuss the adjustments with your instructor as early in the course as possible. You must contact ODS and request academic adjustment letters at the beginning of each semester.