Math 36A Probability

Denis Patterson

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Course Website: The course page is on LATTE. All assignments and announcements will be posted there

Lectures: 9 - 9.50 am each Monday, Wednesday and Thursday (Golding Judaica Center 110)

Office Hours: Tuesday 3 - 4 PM and Thursday 4 - 5 PM, Goldsmith 116

Prerequisites: Math 20A or 22B (Multivariable calculus)

Course Overview: Probability theory is a rich and active area of modern mathematics, as well as an indispensable tool in understanding the world around us – probability is deeply embedded in fields ranging from quantum mechanics to statistics to finance and economics. This course introduces the foundations of mathematical probability but with an emphasis on practical calculations over proofs and with plenty of real world examples. The main topics of study will be: combinatorics (how to count things), random variables, conditional probability, discrete and continuous distributions, jointly distributed random variables, moments of random variables and the basic limit theorems (strong/weak law, central limit theorem). If time permits, we will briefly discuss simulation of random variables and/or Markov chains.

Textbook: First Course in Probability by Sheldon Ross (10th edition), Pearson

Learning Outcomes: Upon successful completion of Math 36A students will be able to:

- L1 Solve basic counting problems
- L2 Compute probabilities on a set theoretic basis & use the axioms of probability
- L3 Compute conditional probabilities and check independence of events
- L4 Define random variables for simple random experiments
- L5 Calculate probabilities, expectations and variances of discrete and continuous random variables
- L6 Perform simple computations involving jointly distributed random variables
- L7 Use the weak and strong laws, and the central limit theorem to approximate probabilities

Content Timetable (approximate):

- Combinatorics [1 –2 weeks]
- Axiomatic Probability [2 weeks]
- Conditional Probability [2 weeks]
- Discrete Random Variables [2 weeks]
- Continuous RVs [2 weeks]
- Jointly distributed RVs/Moments [2 weeks]
- Limit Theorems [1 – 2 weeks]

Assessment: There will be two mid term exams and one final exam – the material for each exam is cumulative, i.e. each exam includes all material covered in the course up to that point in time. There will also be weekly homework assigned on LATTE and regular short quizzes during class time (roughly 20-25 minutes long). Late homework submissions will not be accepted (without evidence of extenuating circumstances). Both your homework and quiz grades will neglect your lowest scoring 20% of submissions.

Collaboration and discussion on homework is encouraged but you must write up your solutions independently of your classmates.

Homework will be collected during the Monday morning lecture starting in week 2.

Each students final course grade will be calculated on the following basis:

- Homework – 10% (weekly)
- Quizzes – 10% (roughly fortnightly)
- Mid term 1 – 20% (October 10th)
- Mid term 2 – 20% (November 7th)
- Final exam – 40% (TBA, set by the registrars office)

Extra credit: 2% for participation (e.g. lecture attendance, asking questions, answering questions, attending office hours) and up to another 3% for ad-hoc challenges/puzzles throughout the semester.

Teaching Assistants: Tarakaram Gollamudi (PhD candidate, Math), gtr@brandeis.edu
Zihao Liu (Masters, Math), zihaoliu@brandeis.edu

Graders: Ray Maresca (PhD candidate, Math), raymondmaresca@brandeis.edu
Hanyu Song (Applied Math/CS/Econ junior) shydaniel@brandeis.edu

Succeeding in this Course: You should spend 9 hours each week working towards achieving the learning outcomes (above) *in addition to* attending lectures and office hours (the latter as needed). I suggest preparing for each lecture by carefully reading through the material in the textbook beforehand so that you can get the maximum benefit from each lecture — it is generally more productive if you enter lectures with questions you need answered, rather than leaving lectures with questions you need answered! You should spend a small amount of time reviewing the material covered in each lecture and the remainder of your time would be best devoted to homework and solving other practice problems. Your understanding of the material will mostly be tested by solving problems so it is sensible to devote the majority of your time to becoming proficient at these calculations.

Accessibility Support: If you are a student with a documented disability on record at Brandeis University and wish to have a reasonable accommodation made for you in this class, please contact me immediately.

Academic Integrity: You are expected to be honest in all of your academic work. Please consult Brandeis University Rights and Responsibilities for all policies and procedures related to academic integrity. Allegations of alleged academic dishonesty will be forwarded to the Director of Academic Integrity. Sanctions for academic dishonesty can include failing grades and/or suspension from the university.