Math 335 – Probability (Fall 2023)

Instructor: Kevin Woods. Call me Kevin! (he/him)

Contacting me: Kevin.Woods@oberlin.edu or 443-695-1681 (mobile). Email is better for involved or less important questions; texting is better for quick, time-sensitive questions.

Class: TuTh 1:30-2:45pm, King 323.

Google Drive: I will post handouts, assignments, and other material in the course Google Drive folder. I recommend bookmarking this link (it is available from blackboard, if you need).

Problem sessions: Fridays 12-1:30pm, Math Library (King 203). Come individually, come in groups, come with questions, come to get started on the homework with other students around. Your choice! Showing up to this is a great way to find other students to collaborate with.

Other office hours:
- Mondays 10:30-11:30am and 2-3pm, my office (King 220B).
- Tuesdays 12-1pm, my office (King 220B). A great time to practice a presentation!
- Thursdays 12-1pm, my office (King 220B). A great time to practice a presentation!
- Fridays 3:30-5pm, Math Library (King 203; these are the problem sessions for my other class, so I will give them priority, but you are still welcome to come)
- If these times don't work, you can make an appointment via email.

Textbook:
- None! Probability is really a course in problem solving. There are not a huge number of definitions and theorems, so this is material that is best learned by doing problems. I will give you handouts with problems that we will work, plus basic definitions, etc.
- I do like the free book available at www.probabilitycourse.com. You do not need to read this, but you are welcome to. I will notate on the problem sheets what sections we're currently covering, and I suggest that you read it *after* we have covered the material.

Prerequisites:
- MATH 231 (Multivariable Calculus). We will use several tools from this class: partial derivatives, definition of Riemann integral, evaluating multiple integrals over various sets, changing coordinate systems.
- MATH 220 (Discrete Mathematics) is strongly recommended. This is partly to make sure you are comfortable with proofs and ready for a 300-level class (MATH 232 might serve as a substitute for this). At the beginning of the course, there will be material that I will assume you've seen (permutations, combinations, basic set theory) and which is covered in MATH 220, but you could also review that on your own.

Learning Goals: At the end of this course, students will:
- Have confidence solving a variety of problems in probability theory.
- Have practice presenting mathematics to others.
- Have experience thinking meta-cognitively about their problem-solving practices.
- Understand probability concepts, including discrete probability, continuous probability, conditional probability, expectation, variance, generating functions, parameter estimation, convergence theorems, and Markov models.
- Have a toolbox of useful probability distributions and the background to apply probability to other disciplines.
- Have experience working with other students on mathematics (this one is up to you to work on).

Assignments and Grades:

- Your focus should be on **growth**, but grades are a fact of college life. **If I can see that you are working hard and seeking support, you will pass this class.** If you find yourself preoccupied with grades, consider taking it P/NP.
- Each Tuesday, I will give you a schedule of the specific assignments for the next week. These will also be posted in our google folder.
- Note that almost every type of assignment has some sort of forgiveness (dropping some number of them). Life happens: you get busy, you get sick, you self-isolate, you oversleep, you struggle in the class but slowly improve, and I want to acknowledge that.
- Because I drop lowest scores, **I generally don't accept things late.**
- Daily Prep (30%, lowest four dropped).
  - Approximately each Monday and Wednesday by 10pm (in preparation for class on Tuesday and Thursday), submitted through a google form.
  - This will consist of one problem that you've worked out clearly and carefully (and might present) and one problem that you discuss more informally. You should also get started on all of the problems assigned for that day.
  - This will ensure that you come prepared to learn in class, and also prepared to contribute in class. I want to help you be **active** in the learning process.
- Weekly problem set (30%, lowest two dropped).
  - A more standard problem set, due approximately every Sunday at 4pm, submitted via gradescope.
- Presentations and class participation (20%).
  - Much of class-time will be spent on student presentations, rather than me lecturing. You may be called on to present a solution to a problem that was assigned for that day (I will try to email the class the list of presenters by 9:30am, so you can have advance warning). Or I may ask for volunteers to present a solution or to talk about how they started attacking a problem.
  - I know this can be scary for many of you (it used to be scary for me too!), but it is valuable, and you will get better and more comfortable, I promise. If you say "Hey, Kevin, can I practice presenting this for you and then do it for the class tomorrow", I will almost certainly say yes; I have office hours just before class for exactly this reason.
  - When one person is presenting, every student in the class has a responsibility. Ask yourself, "Is this presentation correct, and is it clear?" We are helping each other learn the material, at the same time as helping each other improve our presentation skills.
  - This must take place in **an atmosphere of respect and encouragement**: we have to create an environment where it is ok to tell someone that you think they are wrong or unclear without offending them, and an environment where no small group of students dominate the talking.
  - You cannot participate if you are not here and here on time. I understand that you may have to miss a class or two. Excessive absences or lateness will hurt this portion of your grade.
  - If you show up (on time) almost every day and present adequately when requested, you will earn a B+ on this portion of your grade. To earn a higher grade, you should impress me by presenting harder problems, helping your peers in a supportive manner, etc.
- Final Exam (20%).
  - This will part take-home and part in-class: Sunday, December 17, 9-11am.
  - More details will be provided beforehand.

Working, and working together:

You will get out of this class what you put in it (cliché, but especially true in this class). To me, this means doing the following day-to-day:

- Read the notes on the handouts carefully, so that you will be familiar with any definitions, etc.
- Attempting every problem before it is presented on the board (you will probably not solve every single one ahead of time, but the more work you put into that, the better problem solver you will become).

- Looking back at your notes after class and fixing them so that you have a careful solution to the problem that you will be able to comprehend later.
- Actively listening when someone is presenting. You should be asking yourself, "Is their presentation correct and clear?" If it isn't, we should discuss it as a class afterwards.

Honor Code:
- I encourage you to work together on everything except the exam. Your solutions must be in your own words, however. Work on the problem together, and then go back home and write up your solution.
- You should never go looking for the solution to a specific problem (e.g., don't read someone else's solution, search the internet or a book, or ask reddit/AI/etc. online).
- Some of the problems presented in class will have solutions in the suggested textbook. I recommend only using the textbook for review, but if you do read a problem and solution beforehand, please do not turn in that problem or present it in class.

Support:
- You belong at Oberlin and you belong in this class. People arrive here with different experiences and backgrounds in mathematics. Put in the work, seek out support, and focus on self-improvement, and I promise you that **your mathematical skills will grow**. The rest of us are here to help, including:
- Me! Come by office hours, any time.
- Your peers! Working with other students helps everyone improve.
- **Yourself!** Your skills will improve best if you come at this with a growth mindset: embrace the challenge of this class, persist through difficulty, be inspired (not threatened) by the success of others, seek out support.
- If you have a disability of any sort that may affect your performance in this class, please consult with me and with the Office for Disability and Access. I am committed to meeting the needs of all students in my class.
- **I want you to succeed, and I want to help you succeed.** Please let me know how I can help!