MATH 3160 (Honors) - Probability - Fall 2015

Syllabus

- **Instructor:** Joe P. Chen. MSB 232, joe.p.chen@uconn.edu. Office hours: TuTh 11a-12p & 1p-2p. Also by appointment. Do not hesitate to e-mail me to set up an appointment!
- **Lecture times & locations:** (Honors Section 002) TuTh 9:30a-10:45a, MSB 315.
- **Course grades:** Assignments, 10%; quizzes, 10%; 2 midterm exams, 20% each; final exam, 30%; honors paper, 10%. Everyone will be graded on this rubric; there is no separate rubric for non-honors students. To receive the honors credit (a grade of B- or above), you should have satisfactory performance on assignments, quizzes, and exams, and ALSO fulfill the honors paper requirement.
- **Topics to be covered (and approx. timing):** Combinatorial analysis (1 week); Kolmogorov's axioms of probability and combinatorial probability (1.5 week); conditional probability, including Bayes' formula (2 weeks); discrete random variables (2.5 weeks); continuous random variables (2 weeks); joint distributions, independence, sums of independent random variables, order statistics, and transformations (2 weeks); conditional distribution, conditional expectation, covariance, and correlation (1.5 week); limit theorems (1 week).
- **Prerequisites:** Solid mastery of calculus, up to and including series, limits, partial differentiation, and multiple integration. (UConn equivalent: MATH 2110, 2130, or 2144. A grade of A- or above in all calculus courses is strongly recommended.) Knowledge of these topics will be assumed and invoked freely (and thus *hardly* reviewed) in MATH 3160: during lectures, on assignments, and on exams.. As a reminder, everyone needs to brush up on double integrals (in Cartesian and polar coordinates) by mid-October. (However, vector calculus will not be used in MATH 3160.)
- **Honors requirement:** To evaluate your overall grasp of the material, everyone is required to write a 5-10 page paper on a *single* topic/problem in probability, pure or applied. A topic proposal is due by e-mail on Sunday, October 25 (earlier is better). A first draft of the paper is due on Sunday, November 15. A peer paper conference will then be held during the same week. After that, everyone is asked to revise his/her honors paper and submit a final version by Friday, December 18.

  Detailed logistics of the honors paper will be announced during the semester. Templates from previous semesters will be provided. Please feel free to contact me for any question encountered during the topic proposal or writing process.
- **Textbook:** *A First Course in Probability (9th Edition)* by Sheldon Ross. We will cover almost the entirety of Chapters 1 through 8, plus Section 9.1 (Poisson processes). You are also welcome to use the 7th or 8th edition of the book. Note, however, that my lectures will NOT follow the text verbatim. The course videos, notes, and handouts are the definitive word in this class.
- **Supplementary resources:**

  MATH 3160 lecture notes by Prof. Richard Bass on Ross' text. This is an excellent set of notes which you can use to review the materials. We will also use it as the main reference for select topics.

  Another well-written probability text I will occasionally refer to is *Introduction to Probability (2nd ed.)* by Charles Grinstead and J. Laurie Snell, also freely available on the web.
- **NEW! Flipped classroom:** This semester we will conduct the course "flipped classroom" style. This means that you will be responsible for watching short video mini-lectures on upcoming topics BEFORE each class meeting. This will enable us to spend more class time actively engaged in solving problems and more two-way discussions. Link to the videos will be accessible on the Piazza course site.

- **Course web site:** http://piazza.com/uconn/fall2015/math3160honors/home

  To access Piazza for the first time, log in to the HuskyCT course site, click on "Piazza" on the left menu, and then click "Continue" to confirm your enrollment in the Piazza site.

  Alternatively, use this sign-up link: http://piazza.com/uconn/fall2015/math3160honors

  Piazza is an interactive platform where professors and students can ask (anonymously or publicly to the class) and answer questions in real time. This is where all announcements, assignments, and discussions can be found. **Please check it regularly, so you don't miss anything important!**[1]

  Want to ask a HW/lecture question? **Post your question on Piazza.** By doing so you save me the trouble of having to answer the same question multiple times. Plus, once your question appears on Piazza, everyone can see and respond to it, and the whole class benefits. **I will not respond to HW problems via e-mail.**

  Want to ask an individual question regarding course attendance, exam rescheduling, or other private matters? Then send me an e-mail.

  A HuskyCT course site will be operational for grade recording/look-up purposes ONLY. All announcements will be made through Piazza.

- **Exams:** Two in-class midterms (tentative dates: Th 10/8, Th 11/12) and a final exam format TBD. Please let me know if you anticipate any conflict with either midterm date by the end of the 2nd week of classes. Otherwise, the dates will become official.

- **Final exam time from the Registrar (subject to change):** F 12/18 8a-10a.

  You MUST contact the Dean of Students Office (DOS) regarding any conflict with the scheduled final exam times by the week before Thanksgiving. No exceptions! Once DOS grants permission to reschedule your final exam, they will notify me, and I will confirm an alternate arrangement with you.

- **Exam guidelines:** You are allowed to bring n pages of handwritten notes (both sides of an 8 x 11 paper) to the nth exam held. **These and your writing utensils are the only items allowed on the exam. No calculator is allowed; the exam problems will not involve tedious calculations.**

  No make-up exams will be offered unless under the most extreme circumstances, such as a serious illness or family emergency. If you anticipate such circumstances, please notify the instructor as soon as possible, and well in advance of the scheduled exam date.

- **Important dates:** M 9/14, add/drop via Student Admin closes (without a "W"); M 11/2, Last day to drop a course (with a "W").

- **Course preparations & mechanics:**

  The course moves at a brisk pace, so stay on top of the material! Falling behind (by a week) is dangerous and will cause your exam grade to drop (with high probability)!

  Before each class meeting, watch the video lectures, and read the corresponding sections in the text, as indicated on the "course schedule."

  After each class meeting, spend an hour and a half reviewing what was covered ASAP, and begin to work on the corresponding homework problems (takes another hour and a half). This is especially important in the last 2/3 of the course, where the current material builds upon the previous material!

  Homework assignments form an integral component of the course. You should make every effort to solve the assigned problems, using the concepts learned from the lectures and readings. If you don't do the homework, you cannot do well on the exams. Probability is part concept and part problem-solving: learning how to interpret the word problems and using the right (conceptual) tools is as important as carrying out the nitty-gritty calculations.

[1] Piazza is also available as a mobile app through the Apple App Store (iOS) and Google Play (Android).

If you have any question, come see me during office hours, ask on Piazza, and/or talk to your classmates. Help each other out!

- **Homework format & guidelines**

  Assignments are due at the beginning of class on Thursdays. Each assignment consists of around 10 problems drawn from materials covered in the preceding week. All assigned problems are fair game for the quizzes (to be administered on the due dates) and the exams.

  Each assignment will be graded out of 2 points. 2 pts if the grader deems that you have put in effort to complete almost all the problems; 1 pt if the effort was met halfway through; and 0 pt if there was a clear lack of effort.

  As a rule of thumb, I will NOT accept any homework for grade once the solutions are posted on Piazza. So if you have trouble turning in your HW in class on the due date, make sure to use your smartphone to take clear pictures of your assignment, and e-mail them to the instructor ASAP.

  If you have a valid excuse for an HW extension (such as illness, family emergency, or athletic commitment), please secure the appropriate permission and e-mail me **in advance**.

  In all there will be 11 assignments for this course. **Your lowest HW score will be dropped.**

- **Homework guidelines**

  Please clearly write down **your name** and **section number** on top of the first page. And if your assignment contains multiple pages, please **staple** them!

  Please write down your solutions **legibly and neatly**. Don't skimp on margins! Remember to properly **define** your variables, **label** your diagrams, etc., so that I know what you're trying to communicate.

  In general, you should **show enough work/reasoning** in deducing the final answer. If you need to refer to a specific result mentioned in class or in the textbook, please indicate so as well. **Insufficient or uncited work will receive reduced or no credit.**

  Collaboration on HW is allowed and encouraged. Please indicate on the top of the first page the name(s) of those with whom you collaborate. However, **you should write up your work on your own and in your own words.**

  Blatant duplication or paraphrasing of others' work (*e.g.* publisher's solution manual or solutions from previous semesters) without attribution is considered **plagiarism**, and will be dealt with under UConn's academic integrity policy. Consequences may include, but are not limited to, zeroes on the assignments and a grade of failure in the course.

- **Quizzes will be given on Thursdays**, except for the 1st week and the two midterm exam weeks. They will start at 9:30 sharp, last 10-15 minutes, and cover the assignment due the same day. **No make-up quizzes will be given** under any circumstance. **Your two lowest quiz scores will be dropped.**

- **Special accommodations**

  If you are a student-athlete or a student with disabilities, please provide me with a letter from the appropriate office (the Counseling Program for Intercollegiate Athletes (CPIA), or the Center for Students with Disabilities (CSD)) concerning your special needs (*e.g.* when taking exams), so that I can make appropriate accommodations.

  If you suffer a prolonged illness during the semester, please send me a doctor's note ASAP stating the period for which you will be out of the classroom, unable to submit assignments or take exams. This is all the information I need to adjust the weights that go into your grades.

- **The Student Code**

  Everyone is expected to read and abide by the UConn Student Code, especially Appendix A: Academic Integrity in Undergraduate Education and Research and the associated FAQ. Any academic misconduct will be dealt with under the policy stated there.

- **Any question?** Please don't hesitate to contact me! Don't put off till the last minute for help!

Now for some disclaimers...

The advantage of having previously taught MATH 3160 is that I can share some useful advice with you, based on my experience and the students' feedback from the last time around.

- This is a course on the theory and applications of probability. Since there is a sizable theoretical component, we will unavoidably discuss mathematical proofs from time to time. Please do not be scared by theorems and proofs! Instead, try to embrace them and understand their essence. More often than not, these "cold hard facts" give rise to more interesting consequences & applications![2] I will make it a point to explain why you should know these hard facts, and support them with examples.

- I encourage you to read some of the advice from my MATH 3160 students from past semesters. When you come to this course, you already have some intuition about (combinatorial) probability, though you might not know all the mathematical language which formalizes this intuition. As a result, you may experience some confusion reconciling the intuition with the hard math. This is the 'growing pains' phase which many students have attested to. Rest assured, once you get past these growing pains, you can use the math to justify or debunk your intuition, and come out a better practitioner of probability than ever before. (You can count me on helping you achieve this goal!)

  Any time you are confused by something, ask right away! Don't put the questions off till exam time!

- This course is essential to the actuarial majors as it prepares them for the actuarial probability exam. From my experience in 2014-15, I was able to cover 99% of the material stated on the actuarial exam syllabus, and I intend to cover the same amount of material this semester, barring unforeseen circumstances. As a result, the course may feel more intense to the non-actuarial audience in the class. (*Example:* Why does an engineer need to learn about moment-generating functions?) I will do my best to balance the various needs of the class. If at any point you have any concern about the way the lecture is conducted, tell me immediately.

- Two things I will say upfront about the style of my course:

  1. With positive probability I will make the material appeal to you. Believe it or not, I take great pleasure in creating homework/exam problems for probability. You will find plenty of UConn or pop-culture related problems in this course. Some examples I used in Fall 2013 include: Panda Express at the Student Union; UConn football's dismal record; Sara's Pockets [the Mediterranean eatery on N. Eagleville Rd]; MSB; Shabazz Napier, Ryan Boatright, and Kemba Walker. In Fall 2014: Susan; Babbidge library; Yik Yak; E. O. Smith High School; Yale's upset win over UConn in men's basketball; UConn women's basketball. If you have any fun problems to suggest, I'd love to hear them!
  2. From time to time I will [in the words of a former MATH 3160 student] "drop bombshells" on the class, in the form of mathematical theorems which will astound/confuse/disorient you. But these are not just any bombshells, they are "timeless bombshells." When you experience these moments as described, don't panic: these are precisely the HIGHLIGHTS of MATH 3160 I want you to remember. It's the very reason why you are here in this class.

[2] This is what separates a "grown-up" version of probability like ours from a "baby" version of probability taught in high school.