MATH 755/855: Probability with Applications

Fall 2021; Sections 01, 1SY

Lecture times: M/W/F; 9:40-11:00am

Location: Kingsbury Hall, S320 or through Zoom at URL: https://unh.zoom.us/j/8519942083

Instructor: Ernst Linder, N321B, Kingsbury Hall (office); Office phone: (603) 862-2687;

Email: elinder@unh.edu

Office hours: Monday/Wednesday, 2:00-3:45 pm and/or by appointment.

On-line **Textbook:** H. Pishro-Nik, "Introduction to probability, statistics, and random processes", available at https://www.probabilitycourse.com, Kappa Research LLC, 2014.

Hardcopy available (eg Amazon) for ~ $ 23.—

The textbook includes many worked examples and even some Videos.

Distance Learning: Course Delivery:

This course is delivered synchronously on-line using ZOOM. Try it by going to http://zoom.unh.edu ; join a "meeting" and play with the software. Try to set up your audio (microphone and loudspeakers) functions. Make sure that you are not producing echoes and extraneous noises when you have both, mic and loudspeakers on at the same time. Sometimes we recommend an earphone or a headset. Class materials, such as class notes, homework, and recordings will be posted on Canvas (myCourses.unh.edu).

ZOOM provides a fully interactive platform for course delivery and student participation. ***It is therefore expected that students attend the class either in person in the classroom, or, virtually from a computer during the scheduled class time.*** While the classes are recorded for replay at a later point in time, it is not acceptable for students to never attend class when it is scheduled and simply peruse the recording later. The recordings are to be used for re-play in cases where parts of the lecture were not clearly understood the first time. ***Students who anticipate having time conflicts with the scheduled classes need to inform the instructor of their planned absences from the live class.***

It is also expected that students who attend the class from a distance have the necessary equipment that allows them to fully participate in the course, in particular a microphone (a laptop mic tends to be sufficient).

Course outline: This course is an intermediate introduction to the theory of probability for students in mathematics, statistics, engineering, computer sciences, etc. who possess the working knowledge of the techniques of both single variable and multivariate calculus.

It attempts to present not only the mathematics of probability theory, but also, through numerous examples, the many diverse possible applications of this subject.

The construction of sample spaces and probabilities of random events will be carefully developed. Random variables, both discrete and continuous, probability functions and densities are then discussed and distributions of more complex variables such as statistical estimators will be derived using transformation methods. Finally, joint and conditional distributions as well as limiting or large-sample distributions will be examined.

Course Coverage: Chapters 1 – 7 plus some materials from Chapters 10, 11, 13 (time permitting). I will occasionally supplement the text's coverage with additional material. It is expected that you learn these additional material, unless I tell you otherwise.

Computer usage: We will use the statistical software R to illustrate the concepts and theories. If you have never used R, I recommend you take the 1-credit on-line R course (MATH 759/859) for background.

Homework: You are expected to attend every class session and the weekly assignments will be given in the lectures, which are related to that week's material. It is very important that exercises be completed in a timely manner. Doing your homework and finding your own mistakes is an important activity for helping to understand the course material. Late homework is not accepted. It is important that you start working from the very beginning. We will keep using the material from earlier parts of the course later on, and therefore it is essential that you understand it.

Exams: There will be three in-class midterm exams and one in-class final exam. Each midterm exam will take one and half hours.

The **final exam** is comprehensive.

The times of midterm exams will be announced in the lecture (at least one week before the date of the exam) and the final exam will take place according to the University's final exam

Grade Calculation: Midterm exams: 45%, Final Exam 25%, Homework 30%.

Graduate Students: I will occasionally assign problems in the homework designated as *"for statistics graduate students only"*.

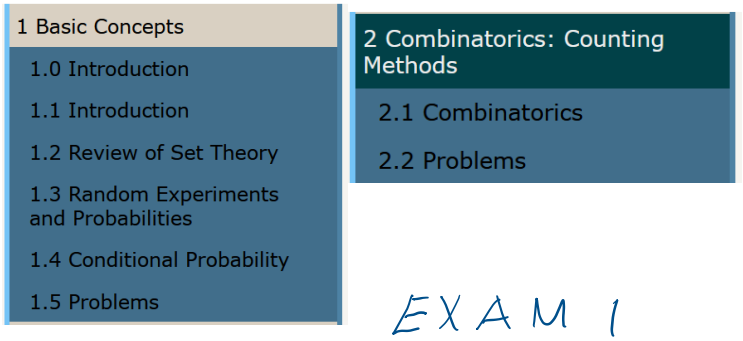
Statistics Ph.D. students: It is recommended that you solve additional problems beyond the ones that are assigned to everyone. It is also recommended that you review the material carefully and perhaps also seek additional reference books for a more in-depth study of the material. It is strongly recommended that you gain a deep understanding of this material in order to be able to pass the first Comprehensive Exam in Statistics Theory.

Tentative Schedule: (16 weeks minus 6 classes = 14 full weeks)

Week 1: Aug 30+

Week 2: Sept 7+ (2 classes)

Week 3: Sept 13+



Week 4: Sept 20+

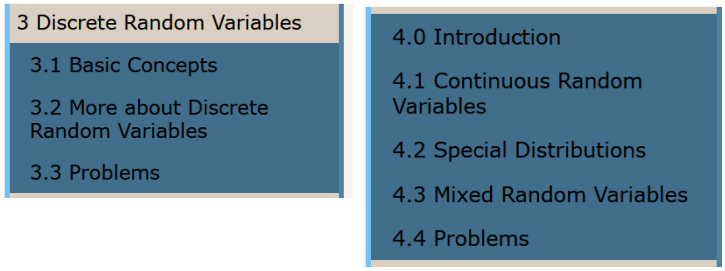
EXAM 1

Week 5: Sept 27+

Week 6: Oct 4+

Week 7: Oct 12+ (2 classes)

Week 8: Oct 18+



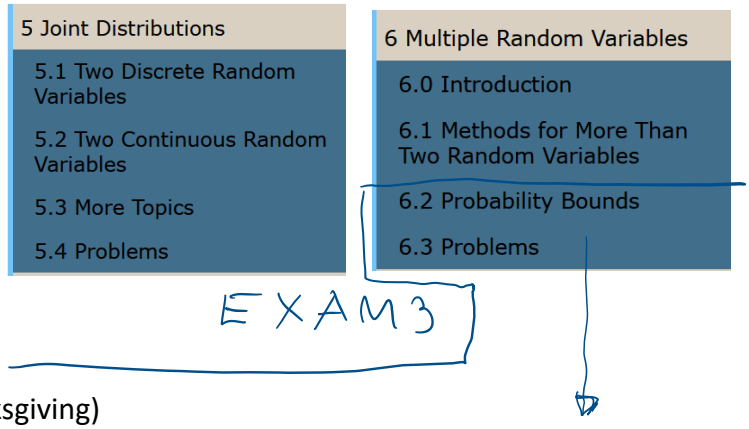
EXAM 2

Week 9: Oct 25+

Week 10: Nov 1+

Week 11: Nov 8+

Week 12: Nov 15+

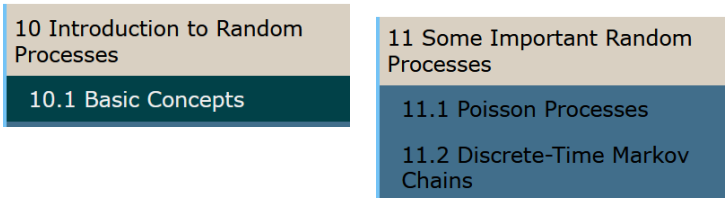


EXAM 3

Week 13: Nov 22+ (1 class) (Thanksgiving)

Week 14: Nov 29+

Week 15: Dec 6+



Week 16: Dec 13+ (1 class) (Review)