

# Welcome to MATH/STAT 395.

**Course description:** Jointly distributed random variables; conditional distributions and densities; conditional expectations and variance; covariance, correlation, and Cauchy-Schwarz inequality; bivariate normal distribution; multivariate transformations; moment generating functions; sums of independent random variables; Central Limit Theorem; Chernoff's inequality; Jensen's inequality. Prerequisite: either a minimum grade of 2.0 in MATH 394/STAT 394, or a minimum grade of 2.0 in STAT 340. Offered: jointly with MATH 395

## Logistics

**Instructor:** Harshil Desai (he/him)

**Classroom:** PCAR 391

**Class times:** MWF 8:30-10:40 am Pacific time. Lectures will be recorded and posted to Canvas under "Zoom." I will take a 10 minute break around 9:30 and resume class around 9:40. I will not take attendance but I highly encourage you to attend. Summer quarter can be fast paced, and thus it can be very easy to fall behind.

**Email:** [hhdesai@uw.edu](mailto:hhdesai@uw.edu) . When you send me an email, please include "[STAT 395]" or "[MATH 395]" in the beginning of the subject line. This will ensure I see your emails and respond in a timely manner.

**Ed:** The primary place to ask questions about course content will be Ed (link in the sidebar). I highly encourage participation in both answering and asking questions. Extra credit may be given out depending on Ed participation. Don't send emails to the teaching team, except for personal matters. Use Ed to ask any general questions, everyone will benefit from the question and the answer.

**Textbook:** The textbook for the course is Introduction to Probability (Cambridge Mathematical Textbooks) 1st Edition by David F. Anderson, Benedek Valkó, and Timo O. Seppäläinen. This textbook will be available at the UW library as well. I will refer to this as the main textbook for this course in the syllabus. Here are some good free references recommended by previous instructors: [Jeff Rosenthal's notes \(Links to an external site.\)](#) and [Sheldon Ross' book \(Links to an external site.\)](#). [Casella and Berger \(Links to an external site.\)](#) is a good textbook too with plenty of exercises for you to practice.

**Class pace:** This is an accelerated course, so we will move quickly to cover all of the material.

**Learning goals:** Some of the goals of this class include: giving you the statistical maturity to think in future classes, jobs, or research; problem solving skills; and the ability to communicate your work.

## Class schedule (subject to change)

**Friday July 21st:** Class logistics. Lectures 1 and 2: Joint distributions for collections of discrete random variables. Multinomial random variable. Textbook: 6.1, 6.2

**Monday July 24th:** Lectures 3 and 4: Joint distributions for collections of continuous random variables. Independence of collections of random variables. Textbook: 6.2, 6.3

**Wednesday July 26th:** Lectures 5-6: Independence and transformations of continuous random vectors. Textbook: 6.3, 6.4

**Friday July 28th:** Lectures 7-8: minimum and maximum of random vectors. Sums of random variables. Textbook: 6.3, 7.1

**Monday July 31st:** Lecture 9-10: properties of expectation and variance. Textbook: 8.2

**Wednesday August 2nd:** Lecture 11: properties of covariance. Textbook: 8.4

**Friday August 4th: NO LIVE LECTURE, Zoom Recording:** Lectures 12-13: correlation and multivariate normal distribution. Textbook: 8.5

**Monday August 7th:** Lecture 14-15: moment generating functions and concentration inequalities. Textbook: 5.1, 8.3, 9.1

**Wednesday August 9th:** Lecture 16-17: law of large numbers and central limit theorem. Textbook: 9.2, 9.3

**Friday August 11th:** Lecture 18-19: confidence intervals and Monte Carlo integration. Textbook: 9.3, 9.4

**Monday August 14th:** Lecture 20-21: Conditional distributions Discrete and Continuous. Textbook: 10.1, 10.2

**Wednesday August 16th:** Lecture 22-23: Conditional mean and random sums. Textbook: 10.3, 10.4