Probability theory is the branch of mathematics that deals with modeling repeatable experiments with indeterministic outcomes. It is a language as well as a logical framework used to study randomness. Already in 1812, the great mathematician Pierre-Simon Laplace famously wrote:

It is remarkable that a science which began with the consideration of games of chance should have become the most important object of human knowledge.

In this course we will develop the language of probability theory and its logical structure. We will use this language to study randomness and will come to understand how order can emerge from randomness in certain and predictable ways. Our investigation will give us deep insight not only into a rich and beautiful mathematical field, but into the many fields that probability theory touches. Probability theory is an indispensable tool that finds applications in countless fields, from number theory to quantum theory, from medicine to stock market behavior, from statistics to psychology.

Included topics will cover the basic curriculum from the Math 149a and 149b classes as well as extra material on random walks and stochastic processes. The extra topics will be injected through the course wherever appropriate and whenever accessible to students.

The first three weeks of our course will be held on campus at UCR. During this time we expect to make day visits to Google in Santa Monica, the Rand Corporation in Santa Monica, and NASA Jet Propulsion Laboratories (JPL) in Pasadena where you will hear how probability is used in industry by industry experts. Week 4 through Week 7 of the course will be taught in the U.K. at the University of Sussex. We will visit Kommerzbank in London to hear how probability is used by industry experts in finance. We will also have a planned group outing where we will travel to Old Sarem, Stonehenge and Uffington. We will then overnight in Oxford and students will return to Sussex at their leisure. The U.K. has an excellent public transportation system and students are encouraged to plan trips together independently. The instructor knows the U.K. well and is glad to give advise on local travels.

Textbook Introduction to Mathematical Statistics; Hogg, McKean, Craig. We will supplement the text with my own notes and with the online book by Rick Durrett: Essentials of Stochastic Processes (available at: https://services.math.duke.edu/~rtd/EOSP/EOSP2E.pdf)

Class Location We will meet for three weeks at UCR and then leave the country. We will then continue meeting for four additional weeks in the U.K. The meeting locations at UCR and in the U.K. are to be arranged.
Meeting Time TBA.

Office Hours TBA

Discussion sections Each discussion section, you will work in collaborative learning groups on questions and on worksheets. However, you will also be responsible for presenting problems to the class. You will have ample time to ask questions and have them answered, but you will also be responsible for presenting material and so it is vital that you come prepared to discussion sections.

Exams

Quizzes: You will have weekly quizzes in class. Quizzes consist of two parts. The first will be your in-class test. This will account for 70% of your exam score. After the results are in, you will have to redo your exam. This second part of the exam process will be worth 30% of your quiz score.

Final Exam: There will be two final exams, one will be at the end of the three week session at UCR and will count only towards your grade in the 149a course. The other will be at the end of the four week session in the U.K. and will account for your grade in the 149b course.

During the exams, all students will be required to bring their UCR identification cards. We will give careful instructions during the exam. If you fail to properly follow instructions and correctly fill out your exam coversheet, your exam will not count towards your grade.

Other Graded Material

Written Homework: Written homework assignments will be due each class meeting.

Grading policy Students must take the final exam in order to pass the course. Regardless of your performance in the course, you must earn a passing grade on the final exam in order to pass the class. If you have turned in all of your homework assignments, then your final grade will be no worse than your grade on your final exam. There are 1000 possible points in each of the two classes taught in the program. The points are divided between categories in the following way,

Written Homework: 300 points
Quizzes: 200 points.
Final Examination: 500 points.

Note that you will earn two grades in the program, one that will count as the 149a grade and one that will count as the 149b grade. These grades are independent and the courses will be, as far as work and grades are concerned, considered as separate courses.

Academic Honesty Students caught cheating on an exam will automatically fail the exam and will be reported to the proper authority. You are not required to do your homework in isolation but you must write up your own solutions. Failure to submit your own work
may result in disciplinary action by the University as dictated by the University guidelines regarding plagiarism.

**Expectations** This is a seven week long, eight unit class. This means that we will have approximately 60 hours of instruction and 20 hours of recitation section. Each hour of lecture may require two hours of preparation outside of class for the average student in the class. Note as well that this time does not include time spent in office hours! You should come to class prepared and ready to learn. I encourage questions both in class and in office hours. Doing all of the assignments is crucial.