

# MATH 6358 (23164)

## Probability Models and Statistical Computing

### Fall 2019

#### Course times:

Lecture times are as follows:

- Online video
- Friday 1:00 - 3:00 PM, AH 301

#### Contact Details:

- **Instructor:** Dr. Cathy Poliak
- **Office:** Fleming 11c
- **Email:** cathy@math.uh.edu
- **Phone:** (713)743-7644
- **Office Hours:**
  - Tuesdays 11:00 AM - 12:30 PM
  - Wednesdays noon - 2:00 PM
  - Thursdays 10:30 AM - noon

#### Course Description:

Probability, independence, Markov property, Law of Large Numbers, major discrete and continuous distributions, joint distributions and conditional probability, models of convergence, and computational techniques based on the above.

#### Topics covered:

- Probability spaces, random variables, axioms of probability.
- Combinatorial analysis (sampling with, without replacement etc)
- Independence and the Markov property. Markov chains- stochastic processes, Markov property, first step analysis, transition probability matrices. Longterm behavior of Markov chains: communicating classes, transience/recurrence, criteria for transience/recurrence, random walks on the integers.

- Distribution of a random variable, distribution functions, probability density function. Independence.
- Strong law of large numbers and the central limit theorem.
- Major discrete distributions- Bernoulli, Binomial, Poisson, Geometric. Modeling with the major discrete distributions.
- Important continuous distributions- Normal, Exponential. Beta and Gamma.
- Jointly distributed random variables, joint distribution function, joint probability density function, marginal distribution.
- Conditional probability- Bayes theorem. Discrete conditional distributions, continuous conditional distributions, conditional expectations and conditional probabilities. Applications of conditional probability.

### Recommended Texts:

- Probability with Applications in Engineering, Science, and Technology, by Matthew A. Carlton and Jay L. Devore, 2014.
- Introductory Statistics with R, by Peter Dalgaard, 2002.
- Introduction to Probability Models by Sheldon Axler 11th edition.
- Lecture notes

### Software Used:

- Make sure to download R and RStudio (which can't be installed without R) before the course starts. Use the link [RStudio download](#) to download it from the mirror appropriate for your platform.
- \*\*New: Rstudio is in the cloud: [RStudio.cloud](#).

### Assessment:

- Midterm 1 - 30%
- Midterm 2 - 30%
- Homework - 15%
- Group project - 25%

### Midterms:

Two midterm will be given during the semester. The dates and times will be announced later.

## Homework:

Written assignments will be given several times during the semester. Students will submit their written homework by scanning and uploading their work in BlackBoard. Instructions will be given.

## Group Projects:

- You will form a group of 3 – 4 members.
- A group assignment, consisting of students teaming up, deciding on the data set of interest, posing research questions and applying the material from this course.
- Each group will eventually submit a report of research findings, with some groups getting a chance (or begin required) to present their findings in class.
- The following is a time line for the project.

September 5	Groups formed
October 10	Proposal of project handed in CASA
November 21	Written paper of project due in CASA

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