

## STAT 241/541, Probability Theory with Applications

### Instructor:

Harrison H. Zhou (huibin.zhou@yale.edu)

Office hours: Monday 10:15am-12:00pm (Tentative) or by appointments, Room 204, 24 Hillhouse Ave., James Dwight Dana House.

### T.A.:

James Hu (xing.hu@yale.edu)

TA session: Tuesday 4:00pm-5:00pm (Tentative). Homework discussion. We meet in 24 Hillhouse Avenue, Room 107. Optional, but recommended.

### Class Time and Location:

MWF 9:25-10:15am.

WLH 208 (William L. Harkness Hall, 100 Wall St.).

### Grade:

Weekly Homework: 25%. *Due very Wednesday in class.*

Midterm: 20%.

Final Exam: 45%.

Participation: 10%

### Textbook:

*Introduction to Probability* by Charles M. Grinstead and J. Laurie Snell.

### Course Homepage:

<http://www.stat.yale.edu/~hz68/241/>

### Lectures will cover the following topics:

- Week 1: Discrete probability distributions: uniform and general. Random variables. Expectation.
- Week 2: Continuous probability densities: uniform and general. Buffon's needle. Cumulative distributions functions and transformation. Expectation.
- Week 3: Discrete conditional probability and paradoxes. Independence. Bayes's formula and the prisoner's dilemma. Gambler's Ruin.
- Week 4: Continuous conditional distribution. Independence. Combinatorics and Binomial distribution. Always coming back.
- Week 5: Inclusion and Exclusion Principle and hat check problem. Important discrete distributions. Important continuous densities.
- Week 6: Sum of independent random variables: Binomial and Poisson. Expectation and Variance. The multinomial. The multinomial from Poisson. Covariance and correlation.

- Week 7: Sum of independent random variables: uniform,exponential, normal, and Cauchy. Expectation and Variance. Bivariate normal. Covariance and correlation.
- Week 8: Transformations in many distributions. *Midterm exam in class on Wednesday.*
- Week 9: Law of large numbers. Strong Law.
- Week 10: Central Limit Theorem. Binomial.
- Week 11: Generating Functions. General CLT.
- *Fall recess.*
- Week 12: Markov Chain.
- Week 13: Markov Chain.