**Biostatistics 731 – Statistical Theory I**

**Fall 2017**

**Instructor**

Betsy Ogburn

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Office hours: stop by my office or email anytime! I often work from home but am

available over skype.

**Teaching Assistant**

Bingkai Wang

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Office hours: M 3:00-4:00 (E3030)

**Website**

<https://sites.google.com/site/jhubiostatcore/1st-term/731>

**Class meeting times**

MW 1:30 – 2:50, room W4007

**Course overview**

The goal of this course is to give you a more practical and basic introduction to probability and inference, off of which your 2nd – 4th term courses can build.

**Book**

Statistical Inference (2nd edition) by Casella & Berger

**Homework, exam, and grades**

There is one (short) homework assignment every week. Each assignment will be posted on the website on Wednesday and due the following Monday at midnight. You can email your completed assignment to Bingkai or leave it in his mailbox. You are encouraged but not required to tex your solutions. You may discuss the problems with each other but you must write them up independently and turn in your own work.

There will be a final exam in the last week of class.

Homework will comprise 55% of your final grades, the exam 30%, and class participation 15%.

**Class schedule (subject to change!)**

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| LECTURE | DATE | TOPICS | READING | ASSIGNMENTS |
| 1 | 28-Aug | set theory, calculus of probability, counting, enumerating outcomes | Casella Berger 1.1 - 1.2 |  |
| 2 | 30-Aug | conditional probability and independence; Bayes's theorem | CB 1.3 |  |
| 3 | 6-Sep | random variables; distribution functions; univariate transformations of RVs | CB 1.4 - 1.6  CB 2.1 - 2.2 | homework 1 due |
| 4 | 11-Sep | discrete distributions: Bernoulli, binomial, negative binomial, geometric, Poisson | CB 3.1 - 3.2 | homework 2 due |
| 5 | 13-Sep | continuous distributions: uniform, gamma, beta, exponential, normal, Cauchy; exponential families, location-scale families | CB 3.3 – 3.5 |  |
| 6 | 18-Sep | moments, moment generating functions, multivariate distributions | CB 2.3 - 2.4  CB 4.1 | homework 3 due |
| 7 | 20-Sep | conditional distributions, independence, bivariate transformations | CB 4.2 – 4.6 |  |
| 8 | 25-Sep | random samples, sums of random variables, sample means and standard deviations, distribution of sample mean, order statistics | CB 5.1 - 5.4 | homework 4 due |
| 9 | 27-Sep | convergence, central limit theorem, strong and weak laws of large numbers, delta method | CB 5.5 |  |
| 10 | 2-Oct | method of moments, maximum likelihood estimation | CB 7.2 | homework 5 due |
| 11 | 4-Oct | properties of estimators: consistency, bias, asymptotic distributions | CB 7.3, 10.1 |  |
| 12 | 9-Oct | hypothesis testing, likelihood ratio tests, score tests | CB 8.1, 8.3, 10.3 | homework 6 due |
| 13 | 11-Oct | hypothesis tests continued | CB 8 |  |
| 14 | 16-Oct | review / overflow |  | homework 7 due |
| 15 | 19-Oct | exam |  |  |