Course: Introduction to Mathematical Statistics II – MATH 181B (Fall Qtr)

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Teaching Assistants:

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Office Hours: Thurs 2-3 pm, Fri 2-3 pm APM Room 1131

Class Website: Accessible from http://math.ucsd.edu/~s2das

181B Lecture Location & Times: Solis Hall 104, MWF 8-8:50 am.

181B Final Exam Date & Time: Monday, December 9, 2019, 8-11am.

NOTE: You CANNOT reschedule the Final Exam date and time!
The overall course grade is broken down as follows:

Homework 30%, Midterm 30%, Final 40%.

**NOTE:** this breakdown is firm and non-negotiable.

- All tests are closed book. A formula cheat sheet will be allowed for the midterm and final.
- Bring paper, pencils, and a *nonprogrammable* calculator to all exams. All other electronic storage and communication devices are banned.
- Cheating will be dealt with aggressively and will result in severe penalties.
Discussion Sessions

Section A01 (5:00-5:50 PM on Fridays in Sequoyah Hall, Room 148), TA: Yiren Wang

Section A02 (6:00-6:50 PM on Fridays in Sequoyah Hall, Room 148), TA: Chao Fan

Section A03 (7:00-7:50 PM on Fridays in Sequoyah Hall, Room 148), TA: Chao Fan
Homework Policy

- All homeworks including problems and R assignments should be submitted on Gradescope. This is to avoid issues with misplaced homeworks and also enable more efficient grading.

- R problems must have solution/results as well as sufficiently commented source code. If the source code is not provided no points will be given.

- Late homework will not be accepted.

- Homework deadlines will be Monday 5 pm each week starting from 10/07.
Required Course Materials

**Required Textbook:**

[T1] *An Introduction to Mathematical Statistics and Its Applications* by Larsen and Marx (6th ed.).

**Reference Textbooks:**

[R1] *Mathematical Statistics with Applications* by Wackerly, Mendenhall and Scheaffer

[R2] *Mathematical Statistics and Data Analysis* by Rice (3rd ed.)

The lectures will be primarily drawn from the required textbook by Larsen and Marx.
Prerequisites and Necessary Background

MATH 181A is a strict prerequisite.

Expected Knowledge:

- Random Variables, Expectation and Variance
- Discrete and Continuous distributions e.g. Binomial, Poisson, Normal, Chi-square
- Central Limit Theorem
- Point estimation - Maximum Likelihood, Method of Moments
- Properties of Estimators - unbiasedness, sufficiency, consistency
- Confidence Intervals
- Hypothesis Testing
- Inferences based on the Normal Distribution
Programming Requirements

- Programming assignments should be completed using R.
- Download R from this website: https://www.r-project.org
- R tutorial link on class website
This is the second course in the undergraduate Upper Division sequence on Mathematical Statistics after MATH 181A.

Topics covered include the following, chapter references are from Larsen and Marx:

- Goodness of Fit Testing (Ch. 10)
- Two-Sample Inference (Ch. 9)
- Regression (Ch. 11)
- Nonparametric Tests (Ch. 14)
- ANOVA (Ch. 12)
Topic Overview: Goodness of Fit

- Does sample data fit distribution from a given population?
- **Chi-Square Goodness of Fit test**
- Is there a significant relationship between 2 categorical variables?
- **Chi-Square test of Independence**
1-sample setting discussed in MATH 181A (t-test, z-test)

Two-sample problems may concern equality of means or equality of variances of 2 sets of samples (may be paired or not)

Can be performed on continuous (e.g. normal) or discrete (e.g. binomial) data
Determining relationships between 2 variables

Regression analysis enables prediction of the value of the dependent variable given the independent by fitting a model

Examine appropriateness of such "fitting"
Specific assumptions imposed on distributional characteristics of data for parametric hypothesis tests

Methodologies to construct tests without such assumptions on data

Test construction for two-sample and paired data
How do we extend 2-sample testing when the data are generated from $k$ groups where $k > 2$?

Construct test to check equality of means among the $k$ groups of samples