COURSE SYLLABUS

Office: Room 35, 37 Hillhouse Avenue; E-mail: hanming.fang@yale.edu
Time and Location: Tuesday and Thursday 9:00-10:15am at Becton 102
Office Hours: Mondays 3:00 - 4:30pm and by appointment
Teaching Assistant: Yoonseok Lee (E-Mail: y.lee@yale.edu)

Required Textbook (available at Yale Book Store, reserved at CCL)

Other texts (not required) that cover the same material include (reserved at CCL):
- Hogg, R. and A. Craig, *Introduction to Mathematical Statistics* [Also a good book at a higher level than Hogg and Tanis]

Course Description:
- This course provides an introduction to probability and statistics for math econ/econ majors. It is followed by a course on econometrics, Econ 163b, in the Winter/Spring semester. Students are responsible for weekly reading and problem assignments (listed below). The problem sets will be discussed in the discussion section with the TA.

Evaluation:
- The grade for the course will be based on the problem assignments (20%), a mid-term exam (30%), and a final exam (50%).

Homework and Exam Policies:
- You need to personally submit your homework by the end of the class on its due date. Otherwise, you will receive 0 points for that assignment. Exceptions are given only with a dean’s excuse.
- Make-up exams are given only with a dean’s excuse. Under no circumstances are early final exams given. The final exam may be postponed only under the conditions described in the Yale College Programs of Study, pages 54-55. Note that end of term travel plans are explicitly disallowed as valid excuses.

A Word of Advice:
- Do the reading and problem assignments diligently. The subject matter of this course will be learned better with as many exercises as possible.
- Half of the problems in the midterm and in the final will be directly taken from the assigned homework problems.
Tentative Weekly Reading and Problem Assignment


- Required Readings: §1.1, §A.1, §2.1
- Problem Set 1: §1.1: 2, 7; §2.1: 1, 2, 3, 9, 12, 14, 15
- Due: Thursday, Sept. 9

Week of September 7: Methods of enumeration, conditional probability, independent events, Bayes’ formula.

- Required Readings: §2.2-2.5
- Problem Set 2: §2.2: 2, 6, 8; §2.3: 2, 4, 5; §2.4: 3, 4, 11, 12; §2.5: 2, 6
- Due: Thursday, Sept. 16

Week of September 14: Discrete distributions: random variables, probability mass function, moment generating functions, expectation, mean, variance, standard deviation, Bernoulli distribution, binomial distribution, Poisson distribution

- Readings: §1.2, §1.7, §3.1-3.5
- Problem Set 3: §3.1: 3, 6, 8; §3.2: 4, 7, 8, 10; §3.3: 3, 7, 9; §3.5: 8, 10
- Due: Thursday, Sept. 23
- TA Session: Problem Set 1; Math Review: §A5 (integration), §A6 (multivariate calculus).

Week of September 21: Continuous distributions: Random variables, density function, distribution function, moment generating functions, expectation, uniform distribution, exponential distribution, chi-square distribution, normal distribution, mixed discrete and continuous distributions

- Readings: §3.4, §4.1-4.4, §4.6
- Problem Set 4: §3.4: 2; §4.1: 2, 4, 10, 15; §4.2: 3, 6, 11; §4.3: 10, 11; §4.4: 2, 4, 7; §4.6: 2, 4
- Due: Thursday, Sept 30
- TA Session: Problem Set 2; Math Review: Basics of linear algebra (matrix, determinant etc)
Week of September 28: multivariate distributions: correlation coefficient, conditional distributions, bivariate normal distribution, transformation of random variables

- Readings: §4.5, §5.1-5.6
- Problem Set 5: §4.5: 1, 2, 4, 6 §5.1: 1, 4, 8; §5.2: 1, 7, 10(a,b); §5.3: 1, 3, 10, 13; §5.5: 1, 2, 8, 13, 18; §5.6: 1, 3, 6
- Due: Thursday, Oct. 8

Week of October 5: Sample theory, sums of independent random variables, laws of large numbers.

- Readings: §1.2, §6.1-6.3
- Problem Set 6: §6.1: 2; §6.2: 2,4; §6.3: 3, 9, 12;
- Due: Thursday, Oct. 14

Week of October 12: Central limit theorem, Limiting Moment Generating Functions, Chebyshev’s inequality.

- Readings: §6.4-5, §6.7, §6.8
- Exercises: §6.4: 1, 4, 8; §6.5: 1, 3, 6, 10; §6.7: 3, 4, 5; §6.8: 1, 2 (Due to the upcoming midterm, you do not need to turn in this set of exercises).
- Review for the midterm.

Week of October 19:

- In-class Mid-term Exam, Tuesday October 19
- October 22: Maximum likelihood estimators, properties of estimators
- Readings: §7.1
- Problem Set 7: §7.1: 2, 3, 5, 10, 12;
- Due: Thursday, October 29.

Week of October 26: Estimation of confidence intervals: confidence intervals for means, variances and proportions

- Readings: §7.2-7.5
- Problem Set 8: §7.2: 1, 2, 4, 6, 9, 12, 16, 19, 20, 21; §7.3: 3, 6, 7, 8, 10, 13; §7.4: 1, 2, 11; §7.5: 2, 4, 10, 12
- Due: Thursday, November 4.

Week of November 2: Hypothesis testing: Null and alternative hypothesis, type I error, type II error, significance level, power, p-value, tests of one mean and variance

- Readings: §8.1-8.3
- Problem Set 9: §8.1: 3, 8, 11, 18; §8.2: 4, 5, 9; §8.3: 2, 6, 12
- Due: Thursday, November 11.
Week of November 9: Hypothesis testing (continued): test of equality of several means, Neyman-Pearson Lemma, uniformly most powerful tests, likelihood ratio tests

- Readings: §8.6, §9.1-9.4
- Problem Set 10: §8.6: 1, 5; §9.1: 2, 4; §9.2: 2, 4, 10; §9.3: 2, 4, 5; §9.4: 2, 4, 6
- Due: Thursday, November 18.
- TA session: Review of more linear algebra: inverse of a matrix, vector space, linear projection

Week of November 16: Linear Regression Models: Single variable linear regression, preview of Economics 163

- Readings: §7.8-7.9,
- Problem Set: §7.8: 2, 4
- Due: Tuesday, November 30.

Week of November 23: Happy Thanksgiving!

- Readings: None
- Problems: None

Week of November 30: Review of the course.

Final Exam: Thursday, December 16th, Thursday 2pm

Happy Holidays!