

SYLLABUS FOR STS 532 - SPRING 2026 MATHEMATICAL STATISTICS II

Description: This is a graduate-level course in mathematical statistics. This is the second semester in which we will cover hypothesis testing, confidence intervals, ANOVA, regression models, convex optimization, and sampling algorithms.

Instructor: Shalin Parekh

Contact: shalin.parekh@maine.edu

Class Time: MWF Room 421 Neville Hall 9:00 - 9:50 am

Office Hours: MWF Room 334 Neville Hall 9:55 - 10:45 am

Textbook: Casella & Berger. *Statistical inference*. 2nd Edition. (This may be supplemented by some additional notes)

1. TENTATIVE SCHEDULE

Weeks 1 - 4: Chapter 8 & 9 of C&B - Hypothesis testing and confidence intervals: likelihood ratio tests, Bayesian tests, most powerful tests, p -values. Inverting test statistics, pivots, evaluation.

Weeks 5 - 6: Chapter 11 - ANOVA: one-way and two-way analysis of variance technique. F-tests

Spring break: March 16-20

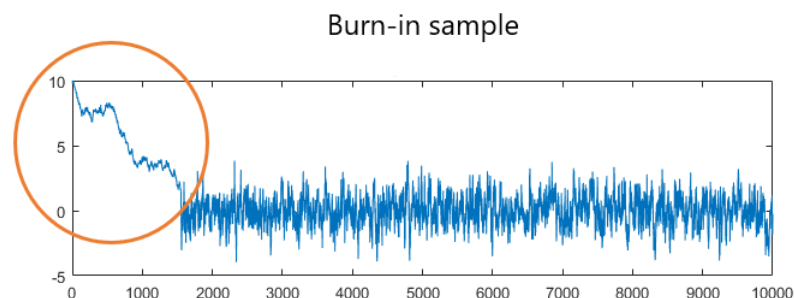
Weeks 7 - 9: Chapter 12: Regression models and least squares minimization techniques. Hierarchical and general linear models. This will be supplemented this with notes from here: <https://sites.stat.columbia.edu/gelman/book/BDA3.pdf>.

Midterm exam: Monday March 30

Weeks 10-11: Convex optimization and gradient descent. This will be supplemented this with notes from here: <https://web.stanford.edu/~boyd/cvxbook/>

Weeks 12-14: Sampling Algorithms - introduction to Markov chains. Perron-Frobenius and random walks on graphs. Overview of MCMC and examples with Metropolis-Hastings. Overview of PageRank.

Final Project: Due May 7th.



2. GRADING

Homework will be assigned weekly from the book. The class grading will be as follows.

Homework: 35%

Attendance and Participation: 20%

Midterm: 15%

Final Project: 30%

3. ACADEMIC HONESTY

The course policy on academic honesty aligns with the University of Maine's code of academic integrity. All students are expected to abide by the code. If a student is suspected to have breached this code, the student will be referred to the Office of Community Standards, Rights, and Responsibilities. For more information on academic integrity, the honor code, and the Office of Community Standards, Rights, and Responsibilities refer to

<https://www.maine.edu/board-of-trustees/policy-manual/section-314/#:~:text=Academic%20integrity%20is%20based%20upon,and%20abilities%20of%20each%20student.>

4. EXTRA HELP

If you are struggling with the course or have any questions, you should make use of my office hours (see above). I am readily available and happy to answer questions. Your classmates are another important resource. Discussing homework and studying together is encouraged, though any written submissions must be your own work.

