

DSST 330: Mathematical Statistics — Taylor Arnold — Spring 2024

Website: <https://statsmaths.github.io/dsst330-s24>

Topics: This course presents statistical modeling using the language of probability theory. Rather than focusing on theoretical results for their own sake, we concentrate on examples in which probability theory provides better approaches and a deeper understanding of statistical models than would be available in a non-probability based course. For each model, we will see how to use the R programming language to apply the technique and will show a real application in which the model can be applied. Specific topics will include Bayesian estimation, the method of moments, credible/confidence intervals, and multivariate linear regression.

Prerequisites: We will assume a general knowledge of random variables, moment generating functions, and other standard topics from a calculus-based probability course (such as MATH/DSST329). No prior experience with statistics or the R programming language is required. However, some prior knowledge will help to best motivate the examples.

General Format: Most class meetings will start by going through a handout that introduces new material followed by working together through a set of exercises that take the form short programming tasks, data collection, and/or mathematical derivations.

Grades: Three cumulative numeric scores will be given throughout the semester: an engagement/participation grade (out of 115), an exam grade (out of 120), and a score for the final project (out of 100). Details are given in the corresponding sections below. The final numeric grade will come from your *minimum* score across these three marks. A letter grade will be assigned as follows: A (93+), A- (90–92), B+ (87–89), B (83–86), B- (80–82), C+ (77–79), C (73–76), C- (70–72), and F (0–69).

Class Engagement: Everyone is expected to regularly attend course meetings and actively participate. Unless otherwise noted, please bring your laptop, a pen or pencil, and all previous course handouts to each class meeting. Attendance will be taken with a sign-in sheet. Each of the twenty three non-exam and non-first week classes are worth a total of five points. In the event that a class meeting is canceled, everyone will be given full marks. In order to ensure a full five points, please arrive by the start of class, have all of your material ready, and participate in all of the class activities.

Exams: There are three exams, each of which may have both take-home (open book and resources) and in-class (closed-book) components. Each exam will be worth 40 points, split evenly between the two parts. Tentative exam dates are given on the course website. There is no final exam.

Final Project: The course has a final project component, which will be presented during the last week of the course. Each student will create materials explaining either a statistical estimator or application that has not been covered during the semester. These will be posted on the course website for reference.

Office Hours: There will be significant time during class to ask questions about the material. Please email to ask additional questions or schedule a one-on-one meeting at any point during the semester. Keep in mind that office hours should supplement rather than replace attending and asking questions during class.