STA 4322: Introduction to Statistics Theory

Spring 2025
Course Meetings:

- Tuesday, Period 8-9 (3:00 PM-4:55 PM): Florida Gymnasium 245
- Thursday, Period 8 (3:00 PM-3:50 PM): Griffin-Floyd 100

Course Website

Instructors

- **Lead Instructor:** Josh Miles
  - **Email (preferred):** miles.j@ufl.edu or Canvas message
  - **Phone:** (352) 392-1941 (Department of Statistics Office)
  - **Office:** Griffin-Floyd Hall 100A (right behind classroom 100)
  - **Office hours**: **Tuesday, 12:00-2:00 PM ‖ Friday, 10:00-11:00 AM ‖ by appointment**
- **Teaching Assistant:** Jithendra Sai Veeresh Addala
  - **Email:** jithendra.addala@ufl.edu or Canvas message
  - **Office:** Griffin-Floyd Hall 209
  - **Office hours**: **Monday, 2:00-4:00 PM ‖ Wednesday, 2:30-3:30 PM ‖ by appointment**

Course Objectives

This course is the second part of the STA 4321/4322 sequence and will use probability to build a foundation for modern statistical techniques. This course will cover

- Estimation methods
- Properties of estimators
- Hypothesis testing
- The linear model

Prerequisites

STA 4321 (Introduction to Probability)
This course assumes familiarity with multivariate differential calculus (gradients and optimization, in particular).

Materials

All materials required to complete this course (lecture notes, digital whiteboards, and assignments) will be available on Canvas. That said, **there is no required textbook** for the course, but you may find it helpful to consult

Mathematical Statistics with Applications, 7^{th} Edition, by Wackerly, Mendenhall, and Scheafer (ISBN: 978-0-495-11081-1),

from which the majority of the lecture notes and problems will be taken.

Attendance

Attendance at lectures will not be recorded nor graded. Students can miss lectures for any reason and need not provide any documentation, except on exam days (see **Assignments and Grading** for details on exam make-ups). I will often make announcements in class, but since attendance is not required, I will make a concerted effort to post Canvas announcements for anything that may affect your grades. **You are responsible for all information communicated via Canvas announcements**. During Tuesday class sessions (except for exam days), we will take an approximately 15-minute break approximately during 3:50-4:05 PM.

All exams will take place in-person, and lectures will usually be in-person as well. Lectures will be recorded and posted **only if** special circumstances merit, in which case lecture will either be an asychronous recording, or lecture will take place in-person as usual but also be recorded. During lecture, I will often use a digital whiteboard to do mathematical derivations that will not be visible in the lecture notes. While I will post these whiteboards on Canvas, I will not take extensive measures to make them well-sequenced and structured to a person who was absent from class. Attending the lectures will therefore be more helpful than the notes and whiteboards alone, and as such, attendance at lectures is encouraged. Moreover, I may occasionally give homework hints and additional help in lectures that will not be recorded nor posted to Canvas.

This course will also abide by the university's attendance and examination policies in the determination of grades and deadlines. The relevant policies are linked in the **Assignments and Grading** section below.

Tentative Schedule

The following is a rough outline of subjects that the course will cover, by week. The time spent on certain subjects will often be somewhat more or less than what is estimated here.

- Week 1: Syllabus + Populations and samples + parameters and estimators
- Week 2: Method of moments + maximum likelihood part 1
- Week 3: Maximum likelihood part 1 + sufficiency
- Week 4: Sufficiency + minimum variance estimation
- Week 5: Exam 1 + sampling distributions
- Week 6: Sampling distributions
- Week 7: Confidence intervals
- Week 8: asymptotics
- Week 9: maximum likelihood part 2
- Week 10: Exam 2 + hypothesis testing
- Week 11: NO CLASS (Spring Break)
- Week 12: Hypothesis testing
- Week 13: Hypothesis testing
- Week 14: p-values + the linear model
- Week 15: The linear model + introduction to Bayesian statistics
- Week 16: Exam 3
- Finals week: No activities (except possibly make-up exams)

Assignments and Grading

The course will have 6 homework assignments and 3 exams that will account for the entirety of the course grade. All homework assignments must be submitted via Canvas. Exams will simply be turned in to the instructor at the end of the exam period.

Homework Each homework assignment will be worth 8% of the final grade. The lowest homework score will not count for a grade; only the 5 highest scores will count for grades. The homework assignments will contain exercises to solidify and expand upon concepts learned in lecture. Depending on the experience of students in the course, homeworks may feature an occasional R programming problem. You will be given at least 10 days to complete each homework. You are welcome to complete the homework assignments electronically (e.g. with LaTeX) or to write them by hand (if you do this, please ensure that your writing is legible and reasonably sequenced). The solutions that you present **should be coherent and have a semblance of logical order** to them (that is, don't just turn in a scratchpad with calculations smattered in no particular order). Other instructions will be written on the individual homework sheets.

You must abide by the following policies when completing homework assignments:
You are **allowed** to

- work in groups and share ideas with one another;
- freely consult the course notes, whiteboards, the suggested textbook (if you have it), and any other resources that I authorize for a given homework assignment.

You are **not allowed** to

- Copy answers from one another;
- Submit on behalf of another student (that is, each student must make their own submission);
- Consult any online resources, nor may you consult ChatGPT or any other natural language AI.

Exams Each exam will account for 20% of the final grade. **There is no cumulative final exam**. The exams will take place during normal class time on Tuesdays (when we have 2 periods to use), and you will be allowed 75 minutes to complete them. **You are not permitted to use any study resources during the exams**; they will be entirely closed-note. All exam problems will ask you to provide a solution to the problem in an open-response format (no multiple choice, fill-in-the-blank, matching, etc.). All solutions should be written in the provided space on the exam sheet. The instructor will provide extra paper on which to perform additional calculations or to finish writing solutions if the provided space is not sufficient. The instructor will provide a clock for you to refer to while taking exams. Other instructions will be written on the individual exam sheets.

Other Notes about Grading

- Homework assignments and exams should be graded within 2 weeks of their due date.
- If you use submission comments on Canvas, please only use them prior to receiving a grade on an assignment. If you make multiple submissions and want your comments to be visible at the time of grading, please copy the comments onto your most recent submission (which is the one that will be graded). If you comment on a submission after receiving a grade or place comments on an old submission, they will most likely not be seen. Please use email or Canvas messages to inquire about already-graded assignments.
- If you have questions about grading policy, please direct them to the instructor.
- If you have questions about the grades that you received, please direct them to the teaching assistant, who will grade all of the assignments.

A statement about assignment and grading philosophy for this course This course is largely built to prepare students for graduate-level study in statistical topics, and everything about the course is made with this in mind. You will find that the homework assignments are tractable from and related to the course notes, but they will challenge you beyond just duplicating problems in the notes. For the exams, you can expect that the problems will be, on average, a little less challenging and a little more closely bound to the course notes than the homework problems are. That said, the exams will ask more of you than just repeating derivations in the notes. The homework problems will serve as the best estimates for exam problems (though the exams will never include any programming-related problems).

Late Homework This course implements Late Hours Provisions and a Base Policy for late submissions of homework assignments. Any circumstances regarding late homework not described below will be handled according to the discretion of the instructor. Please direct all inquiries or concerns about late work policy to the instructor.

A student may request a deadline extension for any homework and for any reason. All requests should be made to the instructor (not the teaching assistant). If the student has a documented absence for one of the reasons in paragraph 3 of the university attendance policies page, an extension of at least 24 hours will be granted (and more if the circumstances merit).

If you do not have formal documentation, you should not expect the request to be granted (though it might be granted). If you have requested an extension but have not received a response (even if you have what you believe to be sufficient documentation), you should assume that no extension will be granted unless you hear otherwise from me.

Late Hours Provisions For homework assignments, each student receives "Late Hours" provisions that, by default, apply before the penalties of the Base Policy are considered. These provisions are as follows:

- Students will be given 3 days (72 hours) of late submission time. These hours act as a "bank" of time to "pay" for lateness on homework, regardless of the reason for late submission. If you use late hours on a homework, it's as though your submission deadline was extended by the number of late hours used.
- Late time is cumulative across homework assignments. For example, if you submit your first homework 24 hours late, you will have 48 remaining late hours to apply to any combination of your remaining homework assignments.
- Late hours will be calculated individually after each homework, and will be rounded down to the nearest hour.
- If you have remaining late hours, they will be applied by default to a late assignment. If you wish not to use your late hour budget for a given assignment, please state so in a comment when you submit the assignment.
- Your late hour usage will be visible to you in Canvas.
- If you receive approval for a deadline extension, your late hours will apply in the same manner to the new deadline.

If you have insufficient late hours to cover the lateness of an assignment, or if you choose not to use late hours for a given assignment, you will be graded according to the Base Policy penalties for any lateness not covered by your late hours.

Base Policy In the absence of any Late Hours Provisions, the schedule below will be applied to late homework submissions. If you have received a deadline extension, this schedule will apply to the new deadline.

A	93-100%
A-	88-92%
B+	83-87 %
B	78-82 %
B-	74-77%
C+	70-73%
C	65-69%
C-	60-64%
D+	55-59%
D	50-54%
E	$\leq$ 49%

- Assignments that are 0-24 hours late will be given a 20% penalty.
- Assignments that are 24-48 hours late will be given a 40% penalty.
- Assignments that are more than 48 hours late will not be accepted and will be given a 0% grade.

Late (Make-up) Exams Make-up exams may only be scheduled when the student has an approved (by the instructor) absence during the period of the exam. To request a make-up exam, students must email the instructor with their request and any supporting documentation. Whenever possible, this should be done **at least one week prior to the scheduled exam date.** If such advance notice is not possible, a request should be submitted as soon as possible before or after the exam period. A full-credit make-up exam is only guaranteed in the event that the student submits documentation of circumstances that fall under the provisions of paragraph 3 of the university attendance policies page. If the student does not provide such documentation, a make-up exam may be offered for 50% credit for only one exam. Beyond this one exam, make-ups exams for exams with undocumented absences will not be permitted, and the student will receive a 0% on any such exams.

Unless special arrangements are approved by the instructor, any exam that is not taken by the end of the semester will receive a 0%. Under the provisions of the university's exam policies, make-ups for the first 2 exams must be completed within the semester, and make-ups for the final exam must be completed within 60 days of the scheduled final exam date (in our case, by Monday, June 30th, 2025).

Final Grades

- 5 (graded) homework assignments (8% each): 40%
- 3 exams (20% each): 60%

The grading scale above will be used.

Final percentage grades will be rounded to the nearest percentage point when assigning letter grades. **Any decision to curve grades will be made at the discretion of the instructor**. In this case, grades would only be curved upward, and the scale above will be used for the curved grades.

Grade points will be assigned to letter grades according to the university's grading policy.

Important Dates

1. Tuesday, February 11: Exam 1
2. Tuesday, March 11: Exam 2
3. Thursday, March 13: NO IN-PERSON CLASS (lecture will be recorded)
4. March 17-21: NO CLASS (Spring break)
5. Tuesday, April 22: Last day of regular class AND Exam 3
6. Tuesday, April 29, 10 AM-12 PM: the scheduled final exam time for this course. This period will not be used (except possibly for make-up exams).

Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at `https://gatorevals.aa.ufl.edu/students/`. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via `https://ufl.bluera.com/ufl/`. Summaries of course evaluation results are available to students at `https://gatorevals.aa.ufl.edu/public-results/`.

Academic Honesty

All instances of academic dishonesty will be handled according to the university's academic honesty policies (see pages 11-14, in particular).