

STAT 153 AND STAT 248: TIME SERIES

INSTRUCTOR: ADITYA GUNTUBOYINA
COURSE OUTLINE FOR FALL 2025
UNIVERSITY OF CALIFORNIA, BERKELEY

- **Instructor:** Aditya Guntuboyina. Email: aditya@stat.berkeley.edu and Website: www.stat.berkeley.edu/~aditya
- **Lectures:** 3:30 pm to 4:59 pm on Tuesdays and Thursdays in 2040 Valley Life Sciences.
- **Office Hours:** 10 am to 11 am on Tuesdays and Thursdays in 422 Evans Hall.
- **GSIs:** Dohyeong Ki (Email: dohyeong_ki@berkeley.edu) and Shana Soohyun Kim (Email: shana22@berkeley.edu)
- **GSI Lab Section:** 9 am - 10:59 am (332 Evans) or 11 am - 12:59 pm (330 Evans) or 1 pm - 2:59 pm (332 Evans) or 3 pm - 4:59 pm (330 Evans) on Mondays
- **GSI Office Hours:** Will be in 428 Evans Hall according to the following schedule:
 - **Mondays:** 5–6 pm (Dohyeong)
 - **Tuesdays:** 2:30–3:30 pm (Dohyeong)
 - **Wednesdays:** 5–6 pm (Shana)
 - **Thursdays:** 2:30–3:30 pm (Dohyeong)
 - **Fridays:** 2–4 pm (Shana)There will be no office hours this week.
- **Readers:** Brandon Xu and Holden Carillo

About the course: Time series (and more generally sequential data) refers to datasets where there is a temporal order for the observations. This course aims to teach you how to analyze such data. The primary objective of time series analysis is to develop mathematical models that provide plausible descriptions for observed time series data. We shall study several time series models in this class including (a) Multiple linear regression models (covariates depending on time), (b) Nonlinear regression models (covariates depending on time), (c) Regularized High-dimensional linear regression models (covariates depending on time), (d) Variance models and spectral analysis, (e) Lagged regressions and ARIMA models, (f) Recurrent Neural Networks.

Prerequisites: Undergraduate probability at the level of STAT 134 or DATA 140 or EE 126 is required. Statistics at the level of STAT 133 and STAT 135 are **strongly** recommended. STAT 135 may be taken concurrently, though some students have found this course challenging without prior completion of STAT 135.

Programming Language: You are free to use any language (e.g., R, Python, Julia, Matlab etc.) for working on your homework. We will be using Python code in class and the lab sections.

Text: There is no required textbook for the class. Here are some materials that you can use as general references:

- Lecture materials from my Spring 2025 offering are available at <https://stat153.berkeley.edu/spring-2025/>. This semester's course will closely follow that version with some (probably minor) updates.
- Prof. Ryan Tibshirani's lecture materials for STAT 153 in Fall 2024 are available at <https://stat153.berkeley.edu/fall-2024/>. There will be some – but not extensive – overlap with our course. Note that the Fall 2024 offering was STAT 153 only (not cross-listed with STAT 248).
- *Time Series Analysis and its Applications* by Shumway and Stoffer: In the past, this has been used as the required textbook for this course. It has good materials on ARIMA modeling and Spectral Analysis.

I will provide materials for each lecture (including slides or typed lecture notes, and code) which will be posted *after* the lecture.

Ed Discussion: I have created a site for this class at Ed Discussion and we will use this platform for Q & A.

Homework assignments: Will be posted on bcourses according to the following schedule. Solutions will need to be uploaded on Gradescope.

- Homework One - will be posted on Sept 04 and due on Sept 15
- Homework Two - will be posted on Sept 18 and due on Sept 29
- Homework Three - will be posted on Oct 02 and due on Oct 13
- Midterm on October 21
- Homework Four - will be posted on Oct 30 and due on Nov 10
- Homework Five - will be posted on Nov 13 and due on Nov 24

You have a total of 120 late hours that you can apply to your homework for the entire semester. No points will be awarded for any homework which brings the total late hours to more than 120.

Exams: For STAT 153, there will be two exams: midterm and Final. The Midterm will be on 21 October in class. The Final exam will be on December 19 from 7 pm to 10 pm.

For STAT 248, there will be one exam: Midterm (in class on 21 October). Instead of the final exam, there will be a final project (details will be announced later).

Assessment: Your final score for the class will be calculated as the maximum of:

$$50\% \text{ Homework} + 20\% \text{ Midterm} + 30\% \text{ Final Exam/Project.}$$

and

$$50\% \text{ Homework} + 50\% \text{ Final Exam/ Project.}$$

Each homework assignment is worth an equal amount (we will not have a policy of dropping the lowest homework).

Differences between 153 and 248: Each homework assignment will have 1-3 additional questions that only students taking STAT 248 need to answer. 153 has a final exam while 248 will have a final project.

Grade Complaints: If you have a complaint against an assigned homework or exam grade and want to talk to me about it, first send me a written request through email explaining your case clearly.

Academic Integrity: Collaboration in small groups on homework problems is encouraged, but your write-up must be entirely your own, and you may not read or copy another student's solutions. You may consult books, online resources, and generative AI tools (e.g., ChatGPT or other LLMs) to support your learning; if you do, you must (i) acknowledge all such sources/tools in your write-up and (ii) ensure you fully understand and can independently reproduce and explain every step of your solution. Copying text, code, or solutions—verbatim or paraphrased—from any source (including AI tools) without clear attribution, or submitting work you do not understand, is cheating. Students found to be cheating risk failing the course and being referred to the Office of Student Conduct.

How to cite AI briefly (example): “Consulted ChatGPT for hints on Problem 4; adapted approach after verifying steps.”

Students with disabilities: If you need accommodations for any physical, psychological, or learning disability, please get in touch with me so that we can make the necessary arrangements.