

Course Syllabus:

STAT 153 - Introduction to Time Series

Professor	Jared Fisher, email: jared.fisher@berkeley.edu * * for private concerns, otherwise please use Piazza
Office Hours	Tuesday/Thursday - 1:30pm - 3:00pm in 387 Evans, or by appointment
Lectures	Tuesday/Thursday 3:40pm - 4:59pm in Hearst Mining 390
GSI	Alan Aw, email: alanaw1@berkeley.edu Friday Sections: 9-11am in 334 Evans, 12pm-2pm in 344 Evans Office hours: TBA
GSI	Andrew Do, email: do@berkeley.edu Friday Sections: 11am-1pm in 334 Evans, 2-4pm in 344 Evans Office hours: TBA

1 Course Description

An introduction to time series analysis in the time domain and spectral domain. Time series data are data points from a single source at different points in time. It's probably incorrect to assume independence, so we look at ways to deal with how the data interact with time.

2 Course Prerequisites

STAT 101, 134 or consent of instructor; 133 or 135 recommended. In other words, you'll need a basic understanding of statistics, probability, and programming in R. I do not enforce these prerequisites as we have students from a variety of majors and backgrounds. However, as you are graded in this class, it is in your best interest to feel truly comfortable with that material.

3 Textbook

Time Series Analysis and its Applications by Shumway and Stoffer, *fourth edition*. An electronic PDF version is available for free via the library website. One thing to note: as stated on page vii, "this book is designed to be useful as a text for courses in time series on several different levels". Thus, part of the book are applicable to our class (mostly chapters 1-4), and others are for graduate-level classes.

4 Topics

We will generally follow the topics presented in the textbook. Our tentative list of topics:

- Trend and seasonality models
- Weak and strong stationarity
- Moving average (MA), autoregressive (AR), and ARMA models
- Best linear prediction
- Estimation: method of moments, least squares, maximum likelihood
- ARIMA and SARIMA models
- Diagnostics and model selection (AIC/BIC, crossvalidation)
- (Discrete) Fourier transform and spectral density
- Time invariant filters and power transfer function

5 bCourses

bCourses will be the hub for class material, grades, and announcements. All lecture slides/notes, sample R code, homework, etc. will be posted there. Early semester materials will also be posted on my website for students on the waitlist/looking to enroll in the class.

6 Piazza

Questions about the administration and material of the course should be asked on Piazza. Our class site is <http://piazza.com/berkeley/spring2020/stat153>. The GSIs and I cannot monitor Piazza 24/7, so please help your fellow classmates. Do not post your entire homework solutions on Piazza and try to be specific in your questions. Again, personal/private/individual questions should be sent directly to me at my email address, while questions about the class should be on Piazza. If you have a question about something, you're probably not the only one! So post questions to Piazza when possible.

7 Assignments

- Homework. Homework will be due on most Fridays at 8:59am (before your lab sessions). No late homework will be accepted, but the lowest 2 homework grades are dropped. You are welcome and encouraged to work in small groups on the assignments. However, as listed in the academic honesty section below, you are expected to write up your own solutions and/or code. Regrade requests for homework assignments must be submitted within two weeks of homework scores being published.
- Exams. There will be three exams: two midterms and the final. The final will be cumulative, but the midterms will only be cumulative in as much as the material builds on itself. Exams, of course, are worked on independently. Regrade requests for the midterms must be submitted within one week of scores being published. Due to the timing of the final exam, no regrade requests can be accepted.

If an emergency prevents you from attending an exam, certification (such as a doctor's note) will be required for alternate arrangements. Missing an exam due to a non-emergency conflict that was not addressed with me in advance should result in a zero. If you do not take the final exam, it is policy that you fail the course.

- Project. Please get together in groups of 3-5 students. Groups with less than 3 or more than 5 students will not be accepted. There won't be individual grades for the group project, but each group will receive a single grade. Due to the timing of the project due date, no regrade requests can be accepted.

8 Grading

For all grading we will be using Gradescope, which allows us to provide fast and accurate feedback on your work. Your Gradescope login is your university email, and your password can be changed at https://www.gradescope.com/reset_password. The same link can be used if you need to set your password for the first time.

Semester composite scores are calculated according to the breakdown shown below. Semester letter grades are based on (1) the distribution of these composite scores, consistent with recommended distributions of Stat course grades and (2) taking into account this term's distribution, i.e. location of gaps as logical cutoffs. Classes in the Statistics Department target about 30% A's, 30% B's, 30% C's, and D/F as needed (plus/minus included). As per point (2) above, I will vary from this as appropriate.

- Homework: 30%
- Midterm 1: 15%, date: Thursday, February 27, in class.
- Midterm 2: 15%, date: Thursday, April 9, in class.
- Project: 10%, due date: Friday April 24
- Final Exam: 30%, assigned time: Friday May 15, 7-10pm, location TBA

9 Notifications

9.1 Accommodation

Students requesting accommodations due to a disability should contact me (the professor) at the start of the semester (or as soon as they become eligible for accommodations) in order to provide you with ample time to meet the required accommodations.

9.2 Scheduling Conflicts

Please notify me in writing (I prefer email) by the second week of the term about any known or potential extracurricular conflicts (such as religious observances, graduate or medical school interviews, or team activities), especially for the exam dates previously mentioned! I will try my best to help you with making accommodations, but cannot promise them in all cases. I have less flexibility with the final exam than the midterms. In the event there is no mutually-workable solution, you may be dropped from the class. In regards to emergencies (i.e. sudden conflicts), see the previous section on exams.

9.3 Academic Integrity

One of the most important skills you can learn is how to find information you need. Even more than remembering the material in this course, I hope you remember where/how to access the material when you need to use again! With that in mind, one of the most important values of an academic community is the balance between the free flow of ideas and the respect for the intellectual property of others. Researchers don't use one another's research without permission; scholars and students always use proper citations in papers; professors may not circulate or publish student papers without the writer's permission; and students may not circulate or post materials (handouts, exams, syllabi—any class materials) from their classes without the written permission of the instructor.

Any test, paper or report submitted by you and that bears your name is presumed to be your own original work that has not previously been submitted for credit in another course unless you obtain prior written approval to do so from your instructor. In all of your assignments, including your homework or drafts of papers, you may use words or ideas written by other individuals in publications, web sites, or other sources, but only with **proper attribution**. If you are not clear about the expectations for completing an assignment or taking a test or examination, be sure to seek clarification from your instructor or GSI beforehand. Finally, you should keep in mind that as a member of the campus community, you are expected to demonstrate integrity in all of your academic endeavors and will be evaluated on your own merits. The consequences of cheating and academic dishonesty—including a formal discipline file, possible loss of future internship, scholarship, or employment opportunities, and denial of admission to graduate school—are simply not worth it.

Cheating on exams and blatantly copying homework will result in failing grades on said assignments and will be reported to the appropriate office. In the event that an exam is disturbed via bomb threat, fire alarm, or other severe classroom disruption, I will announce to the class to grab your belongings and exit silently but immediately, leaving your exam behind in the classroom unless instructed otherwise. The decision on how to proceed with the exam will be made at the time of the alarm. Any talk about or looking at exam material before the exam is finished, without instructor permission, will constitute cheating and your exam will be graded as a zero. Use common sense and honesty and we'll all be fine!

9.4 Enrollment Issues

Once enrolled, please only attend the lab section you are actually enrolled in, to make sure we have enough seats. Before enrollment, you are welcome to attend Friday labs, but only if there is room in the lab for the enrolled students. If you'd like to switch sections, use CalCentral. If there is no room in section you'd like to be in, you can add yourself to the top of waiting list... but this does essentially drop you from the course. For add/drop deadlines, see <https://registrar.berkeley.edu/calendar>.

I must wait to enroll Concurrent Enrollment (CE) students until after the waiting list gets cleared. CE applications will be accepted on two criteria: 1) in order that applications were received, and 2) if up to

date on all assignments. If you are a concurrent enrollment student and a California resident, please let me know.