

# Math 181E Mathematical Statistics — Time Series

**Lectures:** 11:00 - 11:50 am, Mondays, Wednesdays, and Fridays in AP&M B402A

**Instructor:** Danna Zhang ([daz076@ucsd.edu](mailto:daz076@ucsd.edu)), AP&M 6121

Office Hours: Wednesdays 1:00 pm - 3:00 pm

**Sessions:** Section A01 (6:00-6:50 PM on Thursdays in AP&M 6402)

Section A02 (7:00-7:50 PM on Thursdays in AP&M 6402)

**TA:** Dehao Dai ([ddai@ucsd.edu](mailto:ddai@ucsd.edu)), AP&M 5720

Office Hours: Fridays 12:00 pm - 2:00 pm

**Prerequisites:** MATH 181B. Students without taking MATH 181B generally will NOT obtain this instructor's consent to enroll in the course.

**Textbook:** "Time Series Analysis and Its Applications: With R Examples" (4<sup>th</sup> edition) by Shumway and Stoffer. The textbook will be followed pretty closely and the homework problems mainly come from the textbook.

**Overview of the course:** This course covers the concepts and tools of statistical time series analysis and introduces methods both in the time and frequency domains. The mathematical theorems and derivations are an essential part of the course. Topics will include: Stationarity, autocorrelation functions, autoregressive moving average models, partial autocorrelation functions, forecasting, seasonal ARIMA models, power spectra, discrete Fourier transform, parametric spectral estimation, nonparametric spectral estimation, etc.

## Homework:

- **Posting:** Canvas → Assignments (or Canvas → Files → Homework)
- **Due time:** Due time will be indicated clearly in each homework and where it is posted. There will be 7 homework assignments: the first 6 weekly assignments are due on Saturday midnight while the last one is due on Monday midnight.  
**Submission:** Please submit your homework onto Gradescope, not via Canvas. You do not have to type the solutions. Just make sure your (hand or Apple pencil) writing and the submitted version is clear enough. Please provide full justification for your answers. Final answers alone are insufficient and will receive zero credit. For R simulation problems, summarize the relevant results in the "main solution" part and append your R codes.
- **Help:** You are strongly encouraged to first attempt the homework assignments on your own. After that, you may consult the TA or the professor. However, the professor and TA will only help you understand what the question is asking and how to approach the problem, but will not help you check the correctness of your solutions step by step. You must produce your final solutions independently. You must NOT copy solutions from another student or from any other sources.
- **Late homework:** Late homework will not be accepted. Even if you are still on the waitlist, you should submit the homework in the first few weeks on time before official enrollment.
- **Back up:** Please keep a copy of your homework solutions each time in case your online submission is not successful, the submitted version is not clear or the grade is missing.

**Exams:** There will be two in-class midterm exams and a final project.

The midterms take place on Feb 10 (Friday of Week 5) and Mar 10 (Friday of Week 9). More details will be announced when it approaches the exam.

- Each exam is closed-book. You are allowed to bring one piece of (letter-sized double-sided) cheat sheet in each midterm, but no access to any other online/offline resources.
- To keep the fairness of the class, a late exam after the schedule date is generally not allowed. Make-up exam will not be given if you missed the exam on the scheduled date.
- The final project will be due Saturday midnight, March 25. The professor will suggest a list of papers on time series topics accessible to your level of mathematical and statistical understanding. You are required to choose one paper from the list. Whether the paper is expository or data-analytic, connect the material to a theoretically justified methodology as described in some book chapters or papers, with scholarly references to your source material as appropriate. The criteria for grading the report will be: clarity of presentation and thoroughness in connecting the material (expository or data-analytic), to the time series topics covered in the course. A polished report with little connection to the course material will not receive a high grade.

**Grading:**  $40\% * \text{Homework} + 20\% * \text{Midterm1} + 20\% * \text{Midterm2} + 20\% * \text{Project}$ .

**Regrade Requests:** You can always ask for regrading on Gradescope for homework and exam. The deadline for submitting a homework regrading request is one week after the score publish date. The deadline for submitting the midterm regrading request is two weeks after the midterm date.

**Academic integrity:** It is essential that all students adhere to the UCSD Policy on Integrity of Scholarship. **Any cases of academic dishonesty will be reported** to the Academic Integrity Coordinator, and students found to be responsible for a policy violation will be subject to academic and administrative sanctions. You are strongly encouraged to report any dishonesty you observe. Any information of the reporters will be kept strictly confidential, so no harm will be caused to the reporters. Please take careful reading of the complete UCSD Policy on Integrity of Scholarship at: <http://senate.ucsd.edu/Operating-Procedures/Senate-Manual/Appendices/2>.