

## Syllabus

**Course Web Page:** [edoras.sdsu.edu/~bab Bailey/stat673](http://edoras.sdsu.edu/~bab Bailey/stat673)  
and [blackboard.sdsu.edu](http://blackboard.sdsu.edu)

**Meeting Time:** Lectures: MW 5:30 - 6:45 p.m. via a Zoom Meeting

**Instructor:** Professor Barbara Bailey  
Office: GMCS 513  
email: [bbailey@sdsu.edu](mailto:bbailey@sdsu.edu)  
Office Hours: M 4-5 p.m. via a Zoom Meeting; by appointment via a Zoom Meeting

**Reference:** The textbook for the course is

Wei, W. W. S. (2006). *Time Series Analysis Univariate and Multivariate Methods*, 2nd Edition. Addison Wesley.

**Objectives:** Time series data occur when a single experimental unit or process is observed repeatedly over time. Data of this type are common in many different fields including economics, industrial process control, environmental monitoring, epidemiology, and experimental biology. Statistical methods that assume independence are inappropriate for time series data. This course will provide you with the basic theory and tools for the statistical analysis and interpretation of time series. Broadly the methods may be categorized into time-domain and frequency-domain methods. Time-domain methods develop explicit models for the evolution of a process over time. Frequency-domain methods equivalently model the correlation structure of the time series. Other topics include methods for model-based estimation, model selection, diagnostics, forecasting, and computing as they relate to time series analysis.

### Learning Outcomes:

- Define time series data in an appropriate statistical framework.
- Summarize and carry out exploratory and descriptive analysis of time series data.
- Describe and conduct appropriate statistical modeling techniques for time series data.
- Use R competently to model and produce point and interval forecasts and interpret the results for time series data.
- Derive the statistical properties of linear time series models.
- Present and communicate, both orally and in written-form, the results of statistical analyses of time series data.

**Homework:** Homework assignments will be regularly available on the course web page as announced in class. The homework will contain a series of practice problems of which *selected problems* **will** be graded. The homework serves as a tool to review and practice the material covered in class. All material covered on the assignments can be questioned on the exams.

Some problems may require computing and must include concise computer output with a clearly presented version of your code.

Late homework will not be accepted. You may drop your lowest percentage score.

**Exams:** There will be one in-class midterm Wednesday October 14, with a take-home portion due approximately the next week. The in-class part of the exam will be closed book. I will be proctoring the in-class portion via a Zoom Meeting, with cameras on all the time. A hand calculator is necessary for all exams. *No collaboration of any kind is allowed on the take-home part of the exam.*

**No makeup exams are given - no exceptions.**

The final exam will be given Friday, December 11 from 3:30 p.m. to 5:30 p.m. I will be proctoring via a Zoom Meeting, with cameras on all the time. The final will be cumulative and comprehensive.

**Project:** As part of the course you will be asked to do an individual project. The project grade will be based in part on a brief 3-5 page written report in journal style format (i.e., 12 *pt* font, one inch margins, single-spaced, figures and tables clearly presented and labeled, page limit does not include figures, tables, nor bibliography) and a brief 5-10 minute presentation (depending on the size of the class) during the last full week of classes. You are required to attend *all* project presentations. Attendance at the presentations will be a part of your project grade.

The project will be done individually. You will illustrate and present the importance of time series analysis concepts in the literature. In consultation with me, you may choose a journal article of interest to you. As part of the project, expect to read the journal article, write a report, and give an oral presentation to demonstrate a thorough understanding of and to illustrate the techniques/methods used in the article.

**Grading:** The grade for the class is based on a score composed of the following.

Homework	30 %
Midterm Exam	30 %
Project	10 %
Final Exam	30 %

**Prerequisites:** A calculus-based probability and statistics course (STAT 551B or 670B).

**Topics to be covered:** basic outline; topics may be added and/or dropped as the semester proceeds.

1. Fundamental Concepts of Stochastic Processes
  - a. Autocovariance and Autocorrelation Functions
  - b. Moving Average and Autoregressive Representations
2. Stationary and Nonstationary Time Series Models
  - a. Autoregressive Processes
  - b. Moving Average Processes
  - c. ARMA Processes

- d. ARIMA Processes
- e. Seasonal ARIMA Models
- 3. Forecasting
- 4. Fitting Models to Data
  - a. Model identification
  - b. Parameter estimation
  - c. Model diagnostics and model selection
- 5. Spectral Theory
  - a. Fourier Representations
  - b. Spectrum
  - c. Periodogram
- 6. State Space Models
  - a. Kalman Filter

**Code of Academic Conduct on Examinations and Assignments:** “At San Diego State University, students are invited to be active members of the educational community. As with any community, its members serve a vital role in determining acceptable standards of conduct, which includes academic conduct that reflects the highest level of honesty and integrity.” The “Statement of Student Rights and Responsibilities clarifies for students their role as members of the campus community, setting forth what is expected of them in terms of behavior and contributions to the success of our university.” “Inappropriate conduct by Students . . . is subject to discipline on all San Diego State University Campuses. The Center for Student Rights and Responsibilities coordinates the discipline process and establishes standards and procedures in accordance with regulations contained in Sections 41301-41304 of Title 5 of The California Code of Regulations, and procedures contained in Executive Order 628, Student Disciplinary Procedures for The California State University.” See <http://www.sa.sdsu.edu/srr/judicial> for more information.

**Students with Disabilities:** If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619)594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from Student Disability Services. Your cooperation is appreciated.

**Other information:** See course web page: [edoras.sdsu.edu/~babailey/stat673](http://edoras.sdsu.edu/~babailey/stat673)

**See next page for SDSU University Policies**

## UNIVERSITY POLICIES

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**Accommodations:** If you are a student with a disability and are in need of accommodations for this class, please contact Student Ability Success Center at (619) 594-6473 as soon as possible. Please know accommodations are not retroactive, and I cannot provide accommodations based upon disability until I have received an accommodation letter from Student Ability Success Center.

**Student Privacy and Intellectual Property:** The [Family Educational Rights and Privacy Act](#) (FERPA) mandates the protection of student information, including contact information, grades, and graded assignments. I will not post grades or leave graded assignments in public places. Students will be notified at the time of an assignment if copies of student work will be retained beyond the end of the semester or used as examples for future students or the wider public. Students maintain intellectual property rights to work products they create as part of this course unless they are formally notified otherwise.

**Religious observances:** According to the University Policy File, students should notify the instructors of affected courses of planned absences for religious observances by the end of the second week of classes.

**Medical-related absences:** Students are instructed to contact their professor/instructor/coach in the event they need to miss class, etc. due to an illness, injury or emergency. All decisions about the impact of an absence, as well as any arrangements for making up work, rest with the instructors. [Student Health Services](#) (SHS) does not provide medical excuses for short-term absences due to illness or injury. When a medical-related absence persists beyond five days, SHS will work with students to provide appropriate documentation. When a student is hospitalized or has a serious, ongoing illness or injury, SHS will, at the student's request and with the student's consent, communicate with the student's instructors via the Vice President for Student Affairs and may communicate with the student's Assistant Dean and/or the [Student Ability Success Center](#).

**SDSU Economic Crisis Response Team:** If you or a friend are experiencing food or housing insecurity, or any unforeseen financial crisis, visit [sdsu.edu/ecrt](https://sdsu.edu/ecrt), email [ecrt@sdsu.edu](mailto:ecrt@sdsu.edu), or walk-in to Well-being & Health Promotion on the 3rd floor of Calpulli Center.

**Resources for students:** A complete list of all academic support services--including the [Writing Center](#) and [Math Learning Center](#)--is available on the Student Affairs' [Academic Success](#) website. [Counseling and Psychological Services](#) (619-594-5220) offers confidential counseling services by licensed therapists; you can Live Chat with a counselor at [http://go.sdsu.edu/student\\_affairs/cps/therapist-consultation.aspx](http://go.sdsu.edu/student_affairs/cps/therapist-consultation.aspx) between 4:00pm and 10:00pm, or call San Diego Access and Crisis 24-hour Hotline at (888) 724-7240.

**Academic Honesty:** The University adheres to a strict [policy prohibiting cheating and plagiarism](#). Examples of academic dishonesty include but are not limited to:

- copying, in part or in whole, from another's test or other examination;
- obtaining copies of a test, an examination, or other course material without the permission of the instructor;
- collaborating with another or others in work to be presented without the permission of the instructor;
- falsifying records, laboratory work, or other course data;
- submitting work previously presented in another course, if contrary to the rules of the course;
- altering or interfering with grading procedures;
- assisting another student in any of the above;
- using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work);
- copying and pasting work from an online or offline source directly and calling it your own;
- using information you find from an online or offline source without giving the author credit;
- replacing words or phrases from another source and inserting your own words or phrases.

The California State University system requires instructors to report all instances of academic misconduct to the Center for Student Rights and Responsibilities. Academic dishonesty will result in disciplinary review by the University and may lead to probation, suspension, or expulsion. Instructors may also, at their discretion, penalize student grades on any assignment or assessment discovered to have been produced in an academically dishonest manner.

**Classroom Conduct Standards:** SDSU students are expected to abide by the terms of the [Student Conduct Code](#) in classrooms and other instructional settings. Prohibited conduct includes:

- Willful, material and substantial disruption or obstruction of a University-related activity, or any on-campus activity.
- Participating in an activity that substantially and materially disrupts the normal operations of the University, or infringes on the rights of members of the University community.
- Unauthorized recording, dissemination, or publication (including on websites or social media) of lectures or other course materials.
- Conduct that threatens or endangers the health or safety of any person within or related to the University community, including
  1. physical abuse, threats, intimidation, or harassment.
  2. sexual misconduct.

Violation of these standards will result in referral to appropriate campus authorities.