

Statistics 640: Advanced Statistical Theory (4 units)

Department of Statistics and Biostatistics, CSU East Bay

Prof. Eric A. Suess

2024-08-19

Lecture:

- Section 1: MW 2:00 - 3:40pm, North Science, Rm. 119
- Section 2: MW 6:00 - 7:40pm, Web Online Synchronous Class

Instructor: Prof. Eric A. Suess

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Office Hours:

- Tuesday 2:30 - 3:30
- Thursday online 2:30 - 3:30, Zoom link: <https://csueb.zoom.us/j/87552967664>
- or by appointment

Communicating:

Email is the preferred method of communication. Class website will be updated weekly with class topics, homework assignment, and other useful information. Assignment grades will be provided in Canvas. Grades will be posted in Canvas.

Course Description:

Theory of point and interval estimation and hypothesis testing from the Neyman-Pearson point of view. May include: decision theory, non-parametric inference, multivariate analysis, Bayesian methods, computer intensive methods, and statistical bootstrapping and simulation.

Prerequisites:

- Stat. 620 Probability and Statistical Theory

Class Website: cox.csueastbay.edu/~esuess/statistics640

Class Meetings:

- Section 1 of the class is a fully on-campus class. Students are expected to attend all class meetings.
- Section 2 of the class is a fully online synchronous class. Students are expected to attend all class meetings online.
- The Final Exam will be on campus for both sections.

Final Exam Dates: [Final Exam Schedule](#)

- Section 1: W 12/11/2024 3:00 - 5:00pm
- Section 2: W 12/11/2024 8:00 - 10:00pm

Required Texts:

- Kenett, Zacks, Gedeck, [Modern Statistics, A Computer-Based Approach with Python](#). Springer, 2022.

Reference Texts:

- Kenett, Zacks, Gedeck, [Industrial Statistics, A Computer-Based Approach with Python](#). Springer 2023.
- Rice, John, [Mathematical Statistics and Data Analysis, 3rd Edition](#), Duxbury 2007.
- Bain and Engelhard, [Introduction to Probability and Mathematical Statistics](#), 2nd Edition, Duxbury 1992.
- Casella and Berger, [Statistical Inference](#), 2nd Edition, Duxbury 2002.
- Hogg and Craig, [Introduction to Mathematical Statistics](#), 5th Edition, Prentice Hall 1995.
- Roussas, [A Course in Mathematical Statistics](#), 2nd Edition, Academic Press 1997.
- Stone, [A Course in Probability and Statistics](#), Duxbury 1996.
- DasGupta, [Probability for Statistics and Machine Learning](#), Springer 2011.
- Efron and Hastie, [Computer Age Statistical Inference](#), Cambridge 2021.

Further References:

- Wickham, Golemund [R for Data Science](#)
- Ismay, Kim, [ModernDive](#)
- Speegle, [Probability, Statistics, and Data: A Fresh Approach Using R](#)
- Boehmke, Greenwell, [Hands-On Machine Learning with R](#)
- Silge, Robinson, [TidyText](#)
- Baumer, Kaplan, Horton, [Modern Data Science with R, 3rd edition](#), CRC Press, 2017.

Technical Requirements:

Access to a modern computer and permission to install software, Python, Anaconda, RStudio. Access to Colab from your Google account. Access to the internet.

Material To Be Covered:

This is the first course in the sequence of Advanced Statistical Theory courses offered by the Department of Statistics and Biostatistics for the MS in Statistics, Stat. 640, Advanced Statistical Theory is followed by Stat. 641, Bootstrapping Methods.

The main topics to be covered in the 640 and 641 sequence are applications of Limit Theorems, Estimation, Confidence Intervals, Hypothesis Testing, Bootstrapping and Bayesian Estimation.

Probability simulation will be used to demonstrate the theory presented. Data modeling and data analysis will be included to show the theory in action.

Homework:

The material in this course can only be learned through working many problems. Most of the homework assigned during the course will be graded for *content* and *clarity*. Comments will be made and graded problems submitted that need further work should be re-submitted for a final grading.

Homework will be assigned weekly on Mondays. Homework will be “due” on the following Monday, which means you should complete the homework and come to class prepared to ask questions. Homework will be “submitted” though Canvas through the end of the day Friday, of the same week.

Grading: $\geq 90\%$ A, $\geq 80\%$ B, $\geq 70\%$ C, $\geq 60\%$ D, $<60\%$ F

- Homework 30%
- Quizzes 10%
- Midterm I 20%
- Midterm II 20%
- Final 20%

Policy on Make-up Exams:

You are expected to take the quizzes and exams at the scheduled times. In case of genuine emergency, illness or hardship, for which you can present written documentation I may agree to arrange for a make-up exam. Make-up exams must always be arranged BEFORE the regular exam is given and always take place AFTER the regular exam. Quizzes may not be made up!

Academic Honesty:

- You are encouraged to work together on homework problems. However, each student must write up the solutions independently. Copying of solutions is not acceptable.
- You are encouraged to study together for the exams. However, each student must take the exam independently.
- Cheating will not be tolerated. Any student caught cheating will receive a reduced grade or zero for the assignment or exam in question. In addition, the student will be reported to the University for further disciplinary action.

Student Learning Outcomes (SLO's):

1. Derive and understand the theory of point and interval estimation and hypothesis testing.
2. Formulate and model practical problems for solutions using these statistical methodologies.
3. Produce relevant computer output using standard statistical software and interpret results appropriately.
4. Communicate statistical concepts and analytical results clearly and appropriately to others.
5. Understand theory, concepts and terminology at a level that supports lifelong learning of related methodologies.

Student Services:

To access student services offered at Cal State East Bay, click on the MyCompass to get you to your one-stop online student support hub for information on academic advising, tutoring, financial aid, the library, the health center, technology support, career counseling, campus life, equity programs, and more.

Grade Appeal and Academic Grievances:

If you wish to appeal your course grade at the end of the semester or have other academic concerns related to a course, please visit the Grade Appeals and Academic Grievances (GAAG) section of the catalog, which explains the process. URL: <https://catalog.csueastbay.edu/index.php?catoid=31>