

SIO 209 – Signal Processing for Ocean Sciences

Winter 2023 – Syllabus

This course covers advanced signal processing methods and their applications to ocean sciences. In particular, we will introduce discrete random signals, conventional (FFT-based) spectral estimation, coherence and transfer function estimation, model-based spectral estimation, as well as linear prediction, and minimum variance spectrum estimation.

Summary of topics discussed:

1. Inverse filtering and channel equalization
2. Hilbert transforms
3. Discrete random sequences
4. Conventional power spectral estimation
5. Statistical properties of time series
6. High resolution spectral analysis

Time and place: Lectures are on Mondays and Wednesdays 3:30PM – 4:50PM in SPIESS 330.

Instructor:

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Course Website: Handouts and homework assignments will be posted on the Canvas website.

Prerequisites: The prerequisites for the course are a background in discrete-time systems and signals, the discrete-time Fourier transform and its properties, window functions, and the design of digital filters, e.g., SIO207A or ECE161A.

Bibliography: The main reference for this course is the textbook

- *Discrete-Time Signal Processing*, Alan V. Oppenheim and Ronald W. Schaffer, Prentice Hall, 2009.

This textbook will be on reserve at the UCSD library. Additional references will be posted on the course website.

Grades: No exams will be given. Grades will be assigned based on the weekly homework assignments and the mid-term/final projects. The homework assignments count 30%, the mid-term project counts 30%, and the final project counts 40%. The class can be taken either for a letter grade or S/U.

Research Project: A mid-term and a final project will be assigned. These projects should represent individual effort, i.e., they should be considered take-home exams.

Homework: Problems to be solved in Matlab will be posted approximately every 1-2 weeks on the course website and will be due one week later.

Office Hours: Office hours are every Friday at 3 PM via Zoom.

Collaboration Policy: The goal of homework is to give you practice in mastering the course material. Consequently, you are encouraged to form study groups to discuss the course material and problem sets. However, the developed homework solutions should reflect your own understanding of the course material. The mid-term and final project should represent individual effort, and assistance should not be given nor received from anyone other than the instructor.