

SIO 289 – Signal Processing for Ocean Sciences

Winter 2025 – 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. Homomorphic signal processing
4. Discrete random sequences
5. Conventional power spectral estimation
6. High resolution spectral analysis

Time and place: Lectures are on Thursday 3:30PM – 4:50PM via Zoom.

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 references for this course are the textbooks

- *Statistical and Adaptive Signal Processing: Spectral Estimation, Signal Modeling, Adaptive Filtering, and Array Processing*, Dimitris G. Manolakis, Vinay K. Ingle, and Stephen M. Kogon. McGraw-Hill, 2000.
- *Discrete-Time Signal Processing*, Alan V. Oppenheim and Ronald W. Schaffer, Prentice Hall, 2009.

Additional references will be posted on the course website.

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.