UC San Diego | SCRIPPS INSTITUTION OF OCEANOGRAPHY

Syllabus of SIOC 200B
Computational Ocean Acoustics and Signal Processing I

Winter 2024, 09:00-10:20am Tuesdays and Thursdays between 1/9 and 3/14 (total 20 lectures)
Classroom: Eckart 127
Instructor: Prof. Ying-Tsong (YT) Lin, ytlin@ucsd.edu ; office: Keck OAR-2 Room 365
Office hours: Tuesdays 10:35am-2:20pm; Wednesdays: 11:00am-1:15pm; Thursdays 10:35am-2:20pm. Office hours (45 min a session) can be either in person or remote, but by appointment only through the Google Calendar: https://calendar.app.google/yNrdWY63v2TPF2uP8
Lectures recordings are available on podcast.ucsd.edu.

Course Description
Acoustics is one of the most effective tools to explore the ocean from the surface to the depths. In this series of courses (Computational Ocean Acoustics and Signal Processing I-III), students will learn useful computational ocean acoustic models and signal processing techniques for processing and analyzing acoustic data to investigate ocean environmental variability, enhance underwater communication, and boost target detection and localization.
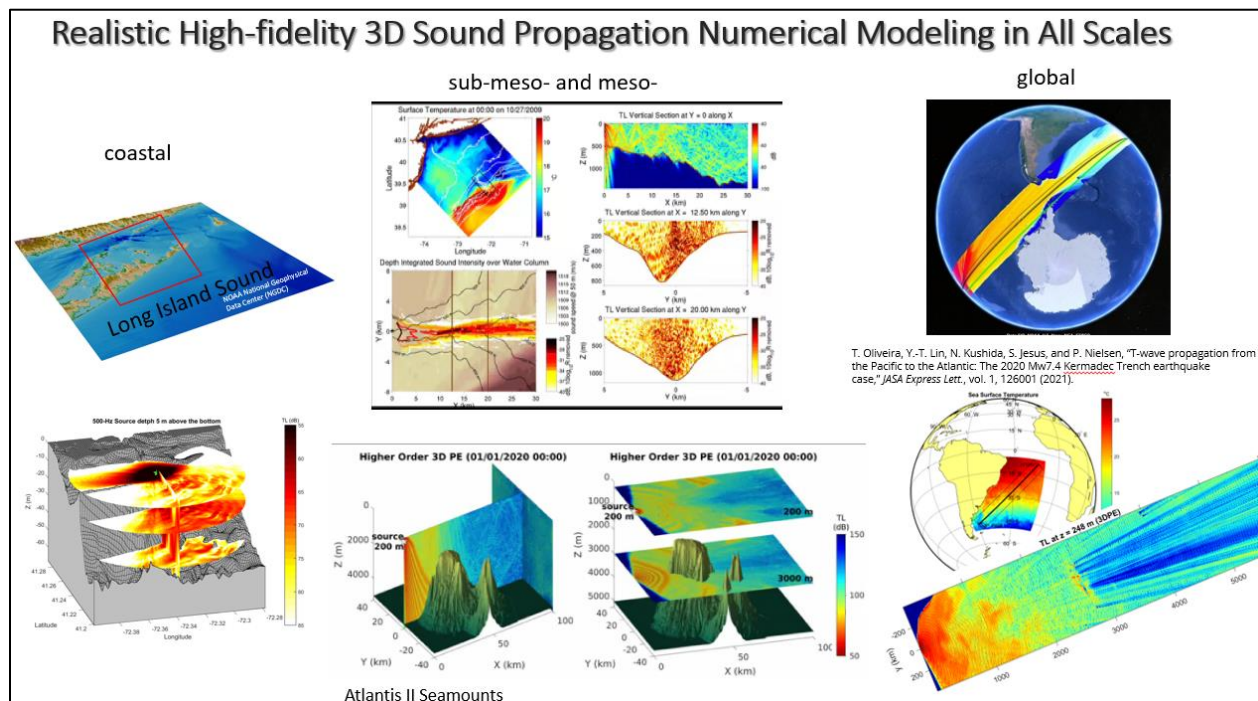
Course Learning Outcomes
Upon completion of this course, students will be able to:
1. understand the fundamentals of ocean acoustics
2. establish solid physical concepts of sound propagation and scattering
3. develop numerical models for underwater sound propagation and scattering
4. master essential signal processing techniques for analyzing acoustic data

Last Updated September 27, 2023

Teaching and Learning Philosophy

Education is the foundation of a successful society.
To inspire students conceptualizing complex ideas
To encourage students thinking beyond mathematical formulas and equations
To enable students connecting and solving real world problems

Lecture Topics

** Students are expected to develop their own computer programs on all subjects covered.
I. Wavenumber Integration Method
II. Pekeris Waveguide Problem
III. Parabolic Equation Method
IV. Matched Filed Processing

Text/Readings/Other Material

Jensen, Kuperman, Porter and Schmidt, 2011. Computational Ocean Acoustics, 2nd Edition.
(https://link.springer.com/book/10.1007/978-1-4419-8678-8)
Frisk, 1994. Ocean and Seabed Acoustics: A Theory of Wave Propagation.
Urick, 1983. Principles of Underwater Sound, 3rd Edition.
Ocean Acoustics Library. https://oalib-acoustics.org/

Technology Requirements

A computer and any scientific programming language.

Grading

Scale: A = 90-100 %,   B = 80-89 %,   C = 70-79 %,   D = 60-69 %,   F = 59 %-below
Weight: weekly homework 80%, final project 20%

Attendance and Participation

Every student is expected to attend all the classes. If missing a class, students should do their
best to study the lecture recording and materials. Students are also encouraged to use the
instructor's office hours for discussions.

Class Calendar

Week #	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	1/08	1/09 9-10:20am Lecture 1 10:35am-2:20pm office hours	1/10 11:00am-1:00pm office hours	1/11 9-10:20am Lecture 2 10:35am-2:20pm office hours	1/12
Week 2	1/15 Martin Luther King, Jr. Holiday	1/16 9-10:20am Lecture 3 10:35am-2:20pm	1/17 11:00am-1:00pm office hours	1/18 9-10:20am Lecture 4 10:35am-2:20pm	1/19

		office hours		office hours	
Week 3	1/22	1/23 9-10:20am Lecture 5 10:35am-2:20pm office hours	1/24 11:00am-1:00pm office hours	1/25 9-10:20am Lecture 6 10:35am-2:20pm office hours	1/26 Homework #1
Week 4	1/29	1/30 9-10:20am Lecture 7 10:35am-2:20pm office hours	1/31 11:00am-1:00pm office hours	2/01 9-10:20am Lecture 8 10:35am-2:20pm office hours	2/02 Homework #2
Week 5	2/05	2/06 9-10:20am Lecture 9 10:35am-2:20pm office hours	2/07 11:00am-1:00pm office hours	2/08 9-10:20am Lecture 10 10:35am-2:20pm office hours	2/09 Homework #3
Week 6	2/12	2/13 9-10:20am Lecture 11 10:35am-2:20pm office hours	2/14	2/15 9-10:20am Lecture 12 10:35am-1:35pm office hours	2/16 Homework #4
Week 7	2/19 Presidents' Day Holiday	2/20 9-10:20am Lecture 13 10:35am-2:20pm office hours	2/21	2/22 9-10:20am Lecture 14 10:35am-1:35pm office hours	2/23 Homework #5
Week 8	2/26	2/27 9-10:20am Lecture 15 10:35am-2:20pm office hours	2/28	2/29 9-10:20am Lecture 16 10:35am-1:35pm office hours	3/01 Homework #6
Week 9	3/04	3/05 9-10:20am Lecture 17 10:35am-2:20pm office hours	3/06	3/07 9-10:20am Lecture 18 10:35am-1:35pm office hours	3/08 Homework #7
Week 10	3/11	3/12 9-10:20am Lecture 19 10:35am-2:20pm office hours	3/13	3/14 9-10:20am Lecture 20 10:35am-1:35pm office hours	3/15 Homework #8
Final Week	3/18	3/19	3/20	3/21	3/22

Last Updated September 27, 2023

					Final Project due

** Office hours can be either in person or remote, but by appointment only through the Google Calendar: https://calendar.app.google/s4MrCghvqFtCzg1z5.

Overall Course Expectations

What you can do to support your success in the course:	What I will do to support your success in the course:
stay current with the course progress	Be prepared and bring my enthusiasm to each lecture and office-hour session
Keep up with readings and homework assignments, as each one builds on the previous one.	Respond to emails within one working day, and provide timely feedback on assignments / submissions.
Contribute to the learning environment with fairness, cooperation, and professionalism	Establish a learning environment with fairness, cooperation and professionalism, and will take action if these principles are violated.
Treat your classmates, instructional assistants and myself honestly and ethically	Treat you honestly and ethically, and will address any concerns you might have
Commit to excel with integrity[1]. Have the courage to act in ways that are honest, fair, responsible, respectful & trustworthy.	Uphold integrity standards and create an atmosphere that fosters active learning, creativity, critical thinking, and honest collaboration.
Manage your time, so you can stay on track with the course and complete tasks on time	Only assign work that is vital to the course, and will work to meet the standard credit hour allotment for the course.
Communicate with me if you determine that a deadline cannot be met due to extenuating circumstances	Consider requests for adjustments and will make reasonable exceptions available to all students when approved

1. Please read UC San Diego's Policy on Integrity of Scholarship and take the integrity pledge!

Diversity, Equality and Inclusion (DEI) Statement
Better science and technology development can be produced in a diversified environment where people with different backgrounds can inspire each other.
My pledge: I (YT Lin) will uphold my belief on DEI and be a role model on creating a welcome research and study environment providing services, partnership, mentorship, and education to underrepresented minority groups and everyone else.

Last Updated September 27, 2023