

SIOC 202A – FUNDAMENTALS OF WAVE PHYSICS

Welcome to the Course

Course Information

Course Description	<i>This course covers topics in surface waves and acoustic waves.</i>
Credits	<i>4 units/credit hours of lecture</i>
Instructor	<i>Xuanting Hao and Ying-Tsong Lin</i>

Prerequisites: familiarity with undergraduate-level fluid mechanics, calculus, ODE and PDE.

Classes

In-person lectures: MW 9:00am-10:20am Location: Spiess Hall 330

Office hours:

Hao (week 1-5): MW 8:00am-9:00am Location: Keck Center 367 Email: x3hao@ucsd.edu

Lin (week 6-10): M 10:35am-2:20pm W 10:35am-1:10pm Location: Spiess 460 Email: ytlin@ucsd.edu

Asynchronous (Online) Course Elements:

UC San Diego's Learning Management System: <https://canvas.ucsd.edu>

Login: UC San Diego Active Directory credentials

Purpose: *Assignment submissions, lecture slides*

Course Materials and Tools

Text/Readings/Other Material

Textbooks

Surface waves:

- Rick Salmon, Introduction to Ocean Waves (lecture notes, to download: <http://www-pord.ucsd.edu/rsalmon/>)
- Young, I. R. Wind Generated Ocean Waves. Amsterdam; New York: Elsevier, 1999. [https://doi.org/10.1016/S1571-9952\(99\)80001-4](https://doi.org/10.1016/S1571-9952(99)80001-4). (available online from UCSD library)
- Dean, R. G., and R. A. Dalrymple. Water Wave Mechanics for Engineers and Scientists. Singapore; Teaneck, NJ: World Scientific, 1991. (available from UCSD library)

Acoustic waves: (freely accessible through UCSD VPN)

- Finn B. Jensen, William A. Kuperman, Michael B. Porter, Henrik Schmidt, Computational Ocean Acoustics. <https://link.springer.com/book/10.1007/978-1-4419-8678-8>

- Herman Medwin and Clarence S. Clay, Fundamentals of Acoustical Oceanography. <https://www.sciencedirect.com/book/9780124875708/fundamentals-of-acoustical-oceanography>
- L. M. Brekhovskikh, Yu. P. Lysanov, Fundamentals of Ocean Acoustics. <https://link.springer.com/book/10.1007/b97388>

Recommended reading:

- Chapter 7 on potential flow in Fluid Mechanics, 6th edition, P. K. Kundu, I. M. Cohen, D. R. Dowling, Academic Press, 2016. (available online from UCSD library)
- Discovery of Sound in the Sea <https://dosits.org/>
- Ocean Acoustics Library – OALIB <https://oalib-acoustics.org/>

Assignments, Projects, and Grading

Summary of Grade Criteria

Assignment	Weight	Due Date
Required assignments (8)	75%	11:59 pm weekly (submit online)
Final exam	25%	03/20/2024 W 8:00a-10:59a Location: TBD

Course Schedule (subject to change)

Week	Title / Topic	Activities, Assessments, and Due dates
1	<ul style="list-style-type: none"> • Kinematics of monochromatic waves • Two waves 	Homework due on 1/21
2	<ul style="list-style-type: none"> • Wave statistics (multiple waves) • Hydrodynamics (deep water) 	Homework due on 1/28
3	<ul style="list-style-type: none"> • Hydrodynamics (finite depth) • Shoaling waves 	Homework due on 2/4

4	<ul style="list-style-type: none"> • Shallow water equation • Ship waves 	Homework due on 2/11
5	<ul style="list-style-type: none"> • Wave forces 	
6	<ul style="list-style-type: none"> • Introduction of Ocean Acoustics • Linear Acoustic Wave Equation and Fundamental Solutions 	Homework due on 2/23
7	<ul style="list-style-type: none"> • Wave Reflection and Wave Refraction 	Homework due on 3/1
8	<ul style="list-style-type: none"> • Scattering, Diffraction, Caustics and Shadow Zones • Ocean Acoustic Waveguide 	Homework due on 3/8
9	<ul style="list-style-type: none"> • Ocean Environmental Acoustics <ul style="list-style-type: none"> -- Marine Mammal Acoustics -- Seabed and Sediment Acoustics -- Ambient Sound and Soundscape Informatics -- Global Scale Undersea Sound Propagation: T-phase waves 	Homework due on 3/15
10	<ul style="list-style-type: none"> • Applications of Ocean Acoustics • SONAR Equations 	

Campus and Course Policies

We expect students to attend every lecture. UC San Diego permits absence for participation in religious observances; see [Academic Regulations & Policies \(ucsd.edu\)](https://ucsd.edu/academic-regulations-policies). UC San Diego expects

all students will adhere to its standards of academic integrity; see [UCSD Policy on Integrity of Scholarship](#).

Grading policy:

1. Late submissions:

Late submissions are allowed, but with limitations. Late submissions will be accepted within one day (24 hours) following the original assignment deadline and will be capped at 50% of the total grade. Therefore, it is strongly encouraged to submit assignments on time to maximize the potential for a higher grade.

2. Extensions: Extensions of assignment deadlines will only be granted in exceptional circumstances. Students should contact their instructor as soon as possible if they believe they have a valid reason for an extension.

Accommodations for Students with Disabilities

If a student foresees the need for accommodations, they should promptly schedule a meeting with the professor. Before accommodations can be implemented, students are required to furnish an Authorization for Accommodation (AFA) letter from the UCSD Office for Students with Disabilities (OSD). It's important to note that accommodations cannot be applied in hindsight, such as after an exam has taken place.

Campus Policies

- [UC San Diego Principles of Community](#)
- [UC San Diego Policy on Integrity of Scholarship](#)
- [Religious Accommodation](#)
- [Nondiscrimination and Harassment](#)
- [UC San Diego Student Conduct Code](#)