SIOC 202B: Fundamentals of Wave Physics: Optics Part (Spring 2022)

INSTRUCTOR:
Dariusz Stramski
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Email: dstramski@ucsd.edu
Tuesday and Thursday 1:00 – 2:20 pm
Office hours: Meetings scheduled in advance via email

PREREQUISITES:
Students admitted to the SIO graduate program or permission of instructor

COURSE DESCRIPTION:
Units: 4 (combined with SIO202B: Seismic Part); Grade: Letter grade only; Required a passing score on midterm and final exams and participation in lectures.
This course is an introduction to physics of light as it pertains to the study of propagation of light within the ocean, interactions of light with seawater constituents, and applications of optical methods in oceanography. Course meetings will consist of lectures by instructor (see Lec on Schedule).

COURSE GOALS:
(1) To gain basic understanding of light and mechanisms by which light interacts with matter.
(2) To become acquainted with concepts and methods of aquatic optics which are used to characterize radiative transfer processes, light fields, and optical properties within natural water bodies.
(3) To appreciate the links and interactions between underwater light, optical properties, and constituents of natural water bodies.
(4) To appreciate the strong flavor of diversity of optical applications in oceanography.

READING:
Ocean Optics Web Book: https://www.oceanopticsbook.info/
A collaborative web-based, dynamically growing, community resource that addresses both the education and reference needs of the broad optical oceanography and ocean color remote sensing communities, which is freely accessible to all. Recommended as an excellent resource on fundamentals of ocean optics.


Lucid account of all the essential aspects of light and optical processes in nature, especially as they pertain to biological research. Recommended reading.

Classic text in ocean optics.

Includes a chapter on Optical Properties of Water (Chapter 43 by C. Mobley)

Example textbooks covering basic topics of electromagnetic theory and light:

GRADING:
Midterm exam: 50%
Final exam: 50%

ASSIGNMENTS:
Students will receive take-home problem sets for midterm and final exams. Students must work on these exams alone and must return the problem sets with solutions by the deadline.

SCHEDULE:
Course meetings will include lectures by instructor (Lec) and will take place twice a week of 1 hr 20 min duration each during a 5-week period of the quarter. Days/time will be determined in consultation with students at the beginning of the quarter.

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<tr>
<th>Week</th>
<th>Type of Activity</th>
<th>Topic</th>
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<tr>
<td>1</td>
<td>Lec</td>
<td>Basic physics of light: The nature and properties of light</td>
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<tr>
<td>2</td>
<td>Lec</td>
<td>Interaction of light and matter</td>
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<td>3</td>
<td>Lec</td>
<td>Radiometry, light fields within and leaving the ocean</td>
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<td>4</td>
<td>Lec</td>
<td>Inherent and apparent optical properties of the ocean</td>
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<td>5</td>
<td>Lec</td>
<td>Radiative transfer in the ocean</td>
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