
Course number	EES 312W (4 credits)
Course title	Research in Ocean Biogeochemistry
Term	Spring 2025
Meeting times and location	Class Lecture: MW 12:30-1:45PM, Lechase Hall, Room 163

Prerequisites

EES 212

Beyond these prerequisites, this course will integrate material learned in Earth and Environmental Science majors to discover new insights in the fields of marine and freshwater chemistry.

College Credit Hour Policy

This course follows the College credit hour policy for four-credit courses. This course meets two times weekly for three academic hours per week. The course also includes (1) extensive independent out-of-class writing assignments and (2) in- and out-of-class laboratory training sessions for both analytical chemical and physical measurements and computer modeling. These laboratory training sessions will equip the students with the skills needed to be successful while working at sea.

Course Description

This course is designed to help students develop their own specific research interests in the fields of marine and freshwater biogeochemistry. Students will work together and with the instructor to develop their own scientific interests and will mature those interests into testable scientific hypotheses. This objective will be achieved through a series of exercises involving in-class discussion, literature research, classroom lecture, writing, peer review, formal and informal presentations, and laboratory training sessions. Through this process the students will (i) develop their own experimental plan to test their hypotheses, (ii) formulate a formal written research proposal of their proposed research, (iii) present and defend their proposal, and (iv) conduct a formal panel review of their peers' research proposals. At the conclusion of this course, students will be invited to participate in an oceanographic research expedition during the summer of 2025 to execute their newly developed scientific plan.

Learning Goals and Outcomes

The primary goals of this course are (1) to equip students with the ability to formulate hypotheses, as well as plans to test those hypotheses, regarding current unknowns in marine and freshwater biogeochemistry, (2) to familiarize students with scientific experiments and sample collection methodologies to prepare them for their own independent research, and (3) to develop the ability to write, review, and defend a formal proposal of research.

Overall, at the end of this course, the student will be able to formulate a proposal for scientific research following the standard format of the National Science Foundation and adequately prepare for independent research in the laboratory and in the field.

Instructor Information

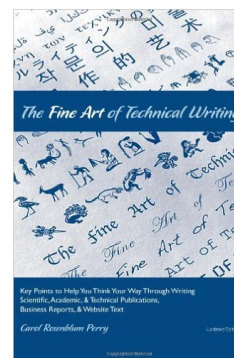
Name Professor John Kessler
Office location Hutchison Hall, Room 210
Email address john.kessler@rochester.edu
Telephone number (585) 273-4572
Office hours Thursday from 4:00-5:00pm (or by appointment)

Teacher's Assistant Information

Name Sydney Loudon (graduate student)
Email address slouden2@ur.rochester.edu
Office location Hutchison Hall, Room 107D
Office hours Friday from 12:30-2:30pm (or by appointment)

Textbook and/or Resource Material

- 1) The Fine Art of Technical Writing (2011), by Carol Rosenblum Perry.
ISBN-10: 1461129249; ISBN-13: 978-1461129240
- 2) G. Gopen and J. Swan (1990), "The Science of Scientific Writing." American Scientist.
- 3) National Science Foundation: Grant Proposal Guide.
https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papp
- 4) Ocean Biogeochemical Dynamics (2006), by Jorge Sarmiento and Nicolas Gruber.
ISBN: 0691017077; ISBN-13: 9780691017075
- 5) The lecture slides, assignments, and additional course materials will be posted on *BlackBoard* as needed.



Course Structure

This course takes a student-centered approach where the students will be given the freedom to develop their own ideas into valid scientific hypotheses. The students will then develop the experimental plan necessary to test those ideas and hypotheses. Finally, the students will prepare their hypotheses and experimental plans into formal written scientific proposals. In order to accomplish these goals, the instructor and students will work together to identify strategies on how to discover exciting and necessary topics of research while learning how to extract information from technical publications and write, review, revise, and defend a formal scientific proposal. More specific information is listed in the course calendar below.

Note: The course structure described here may deviate slightly from this general organization in order to accommodate examinations, holidays, and slight variations in the speed at which material is covered.

Grading Policies

Grading will be based on the following structure:

- Problem sets and lab reports (20%)
- Class participation & presentations (25%)
- Laboratory participation (25%)
- Formal proposal (20%)
- Formal proposal presentation (10%)

Late Assignments: Problem sets and lab reports turned in after the due date will be accepted with a 25% reduction if they are received less than 24 hours after the due date. Any assignment received more than 24 hours after the due date will not be accepted for credit.

Assignment of letter grades:

A	93-100
A-	90-92
B+	87-89
B	83-86
B-	80-82
C	same breakdown as B, between 70-79
D	same breakdown as B, between 60-69
E:	below 60

Instructor Response and Feedback:

Students should expect to receive feedback and grades on their assignment within approximately one week after the due date. Grades will be posted on Blackboard.

Participation

Active and aggressive student participation is vital for the success of this course. Class attendance will be recorded and any unscheduled absences will be promptly investigated by the instructor. Please note that since this course culminates with the students conducting scientific research at sea, regularly scheduled laboratory training sessions will be conducted both during and outside of normal class time throughout the semester. Your participation in these training sessions is vital and excessive unexcused absences may result in being uninvited from the scientific research cruise at sea.

Course Topics, Calendar of Activities, Major Assignment Dates

1) *Module 1 – Introduction to the Course, the Research Already Planned, and Proposal Writing*

- a) Week 1: January 21 – 25
 - i) Course Overview, Introduction to the Research Trip
- b) Week 2: January 26 – February 1
 - i) Search and Reading Scientific Literature, Review of Air-Sea Gas Exchange
- c) Week 3: February 2 – 8
 - i) Learn Experiment 1: Air-Sea Methane Exchange
- d) Week 4: February 9 – 15
 - i) Learn Experiment 2: Methane Oxidation Kinetics
- e) Week 5: February 16 – 22
 - i) Lab tour of Experiment 1, Fine Art of Technical Writing 1 (Student led)
- f) Week 6: February 23 – March 1
 - i) Lab tour of Experiment 2, Fine Art of Technical Writing 2 (Student led)
- g) Week 7: March 2 – 8
 - i) Field and laboratory experiment: Practice for research trip (weather depending)

Week 8: March 9 – 15 Spring Break

2) *Module 2 – Developing New Experiments and Proposals*

- a) Week 9: March 16 – 22
 - i) Describing and Discussing New Experiments
- b) Week 10: March 23 – 29
 - i) Building New Experiments
- c) Week 11: March 30 – April 5
 - i) Building & Testing New Experiments
 - ii) Editing Proposals
- d) Week 12: April 6 – 12
 - i) Testing New Experiments (Laboratory)
 - ii) Editing Proposals
- e) Week 13: April 13 – 19
 - i) Editing Proposals
 - ii) Testing New Experiments in Laboratory (as needed)
- f) Week 14: April 20 – 26
 - i) Final Presentations and Panel Review of Proposals
- g) Week 15: April 27 – May 3
 - i) Final Presentations and Panel Review of Proposals

**Research at sea:
June 22 – 30, 2025**



Americans with Disabilities Act (ADA)

Center for Excellence in Teaching and Learning (CETL), 107 Lattimore Hall, 585-275-9049
<http://www.rochester.edu/college/cetl/>

The Center for Excellence in Teaching and Learning (CETL) offers a variety of disability services for undergraduates and graduate students in Arts, Sciences & Engineering. These services aim to provide an inclusive experience and equal access to academic content and program requirements. Their approach relies on collaboration among students, CETL staff, and instructors. Students are invited to make an appointment to meet with a disability support coordinator to get acquainted and talk about classroom accommodations. CETL also provides transition support and self-advocacy skill development.

In addition, students can find information on other University accommodations and services, including transportation and campus accessibility at: <http://www.rochester.edu/eoc/>

Academic Honesty

All assignments and activities associated with this course must be performed in accordance with the University of Rochester's Academic Honesty Policy. Unless otherwise noted, I strongly encourage active collaboration among students currently enrolled in this course when studying, investigating assignments, and working on laboratory/research activities; this is all part of the course policy promoting discussion and collaboration. However, all individual assignments must be completed independently and must represent the work of only the specific student completing the assignment. In short, work together but write separately and independently. Verbatim copying from another person, scientific literature, textbooks, the web, AI, or any other resource is a violation of the course Academic Honesty policy. A comprehensive description of the University of Rochester's Academic Honesty Policy is available at: www.rochester.edu/College/Honesty