

Faculty of Science Course Syllabus

Department of Oceanography

OCEA5290

Advanced Chemical Oceanography

Winter 2023

Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

We acknowledge the histories, contributions, and legacies of the African Nova Scotian people and communities who have been here for over 400 years.

Instructor(s): *Doug Wallace and Carly Buchwald* *Douglas.Wallace@dal.ca ; cbuchwald@dal.ca*

Lectures: *Tues and Thur; 1:30 – 3:00pm, Steele Building 2-22*

Course delivery: *In-person, will make available virtually if needed, but some lectures cannot be done virtual*

Course Description

This course presents research topics in chemical oceanography, taught as 3-4 self-contained modules. Examples include: the oceanic CO₂ system and its relation to climate change, theory and applications of stable and radioactive tracers, chemical tracers of processes such as advection/mixing and gas exchange, modern chemical measurement approaches including use of sensors.

Course Prerequisites

OCEA 4130/5130

Learning Objectives

At the end of this course students should be able to:

- *Identify multiple chemical tracers used to track physical and biological processes in the ocean.*
- *Explain and solve problems pertaining to multiple methods for determining carbon uptake in the ocean*
- *Identify multiple types of sensors and their benefits and drawbacks.*
- *Solve box-model problems using isotope and mass balance.*
- *Organise learned content into concise, scientifically-supported theories and system understanding.*
- *Research a topic of interest in chemical oceanography and present their research to their peers.*
- *Read complex chemical oceanography scientific papers and be able to discuss them critically with the class.*

Course Materials

- readings will be posted through the Course brightspace
- will include excerpts from Tracers in the Sea (Broecker and Peng), Global Biogeochemical Dynamics (Sarmiento and Gruber), Chemical Oceanography and the Marine Carbon Cycle (Emerson and Hedges)

Course Assessment

Assessment	Weight (% of final grade)	Date
Discussion/Participation	50%	throughout semester
Presentations	25%	scheduled individually
One essay	25%	during finals week

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D	(50-54)
A (85-89)	B (73-76)	C (60-64)	F	(<50)
A- (80-84)	B- (70-72)	C- (55-59)		

Course Policies on Missed or Late Academic Requirements

Late assignments- *Students will lose 5 points per day an assignment is handed in late. An assignment is considered late if it is not handed in at the beginning of the lecture period that it is due.*

Course Policies related to Academic Integrity

Collaboration- *Students are encouraged to discuss assignments in groups. However, each student must write and submit their own answers, rationale, and solutions.*

Course Content (subject to change)

Week	Tuesday	Thursday	Readings
1: Tracer Introduction	Jan 9 Tracer Introduction	Jan 11 -lecture 2 Circulation/Mixing Tracers	Fine- CFC review England et al, 2001- Using Tracers Steinfeldt et al, 2004 Smith et al, 2022
2:	Jan 17	Jan 19- lecture 3 Water mass tracers	Ebser et al 2018- 39Ar Broecker and Peng- 14C
3:	Jan 24- lecture 4 Water mass tracers	Jan 26- lecture 5 Gas Exchange Tracers	
4: Isotopic Tracers	Jan 31- lecture 6 Introduction to Stable Isotopes	Feb 2- lecture 7 Introduction to Radioactive Isotopes	Emerson and Hedges Chapter 5
5	Feb 7 N cycle isotopes	Feb 9 N cycle isotopes	Sigman et al 2005; Rafter et al 2013

6	Feb 14 Carbon cycle isotopes	Feb 16 Carbon cycle isotopes	
Reading week			
7 Methods	Feb 28 Intro to sensors	Mar 2 sensors	Dasha
8	Mar 7	Mar 9	Student led topics
9	Mar 14	Mar 16	Student led topics
10	Mar 21	Mar 23	Student led topics
11	Mar 28	Mar 30	Student led topics
12	Apr 4	Apr 6	Guest lectures

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness

Statement: <http://www.dal.ca/cultureofrespect.html>

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)

<https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=117&chapterid=-1&topicgroupid=31821&loadusercredits=False>

University Grading Practices

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Student Resources and Support

Advising

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: <https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html>

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: <https://libraries.dal.ca/>

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Fair Dealing Guidelines <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness.html

Student Advocacy: <https://dsu.ca/dsas>

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Biosafety: <https://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

Dalhousie COVID-19 information and updates: <https://www.dal.ca/covid-19-information-and-updates.html>