

Introduction to Physical Oceanography (OCEA 3001, CRN 12539) syllabus for autumn 2025
LSC Room 3655, Mon-Wed-Fri 11:25-12:25
Instructor: Dan Kelley (dan.kelley@dal.ca)
Office Hours: By arrangement

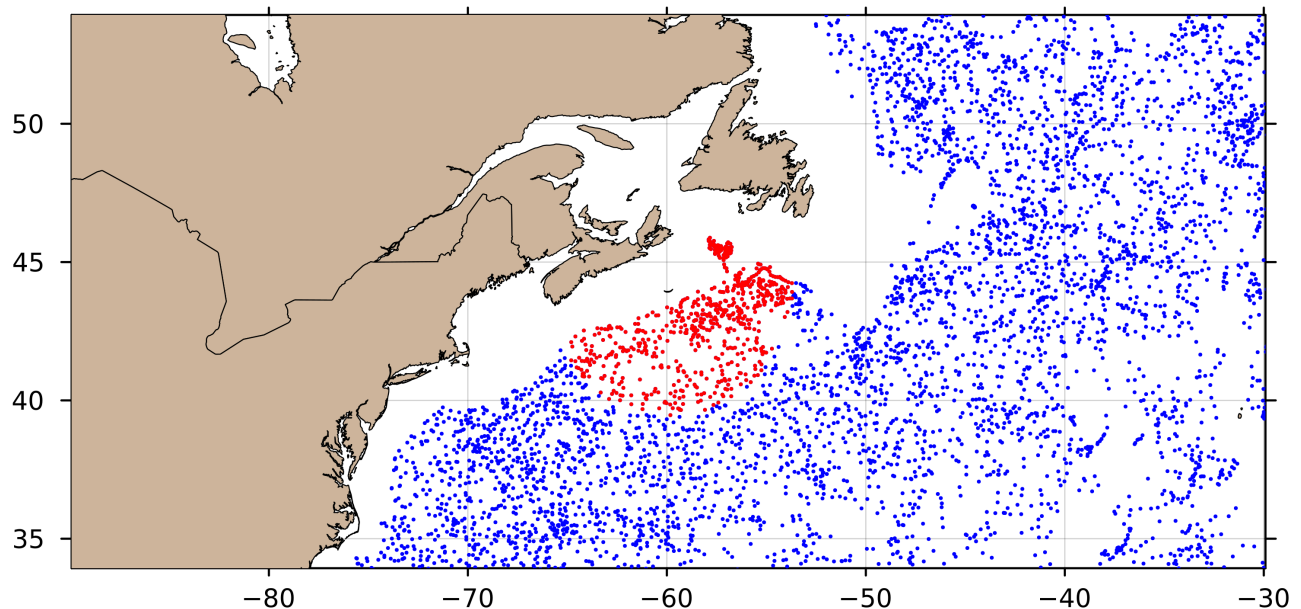


Figure 1: Eastern North Atlantic ocean, showing the locations of profile measurements made by Argo floats over the past 365 days, with red indicating the 687 locations within a 500 km radius of Sable Island.

Course Description

OCEA3001 introduces Physical Oceanography, with an eye to the interests of undergraduates in ocean-related disciplines. The approach is to bind facts together with ideas, often starting with thought experiments before proceeding to simple mathematical models and applications. The lectures are interactive and whiteboard-based. The topic thread takes into account student interests, current events, and other influences. Thinking is a key to success in Physical Oceanography and so it is highly valued in OCEA 3001. This is not a “memorize and repeat” course.

Course Prerequisites and Exclusions

MATH 1000.03 and MATH 1010.03 (i.e. classic calculus), or equivalent is required to take OCEA 3001. Students are expected to understand the principles of Calculus, and not just the rules.

Students must not be enrolled in any other class that has overlapping lecture times.

Student Resources

Some materials will be provided on the course Brightspace page, as appropriate. As this course is not taught by showing slides, no slide “decks” will be uploaded to the Brightspace page. Lecture topics will be explored organically. Students who miss classes are advised to consult other students for notes on topics that were discussed on any given day.

Course Structure

Course Delivery. OCEA 3001 will be taught in-person unless a problem arises with this mode. Recording of lectures is not permitted. Lectures employ a conversational, sometimes Socratic, approach that involves heavy use of the whiteboard and occasional demonstrations. Skipping classes is highly discouraged.

Lectures. Lectures occur in room LSC-3655 from 1135h to 1225h on Mondays, Wednesdays, and Fridays.

Assessment

Assignments. There will be 2 assignments (each worth 20% of the final grade). The timing will be established in collaboration with the students, to avoid undue strain relating to other coursework, fieldwork, etc.

Tests/quizzes. There will be a mid-term test (worth 25% of the final grade), somewhat after the halfway point in the course. (Again, the time will be selected in collaboration with the students.)

Final examination. There will be a final examination (worth 35% of the final grade), during the formal examination period.

Other course requirements

Class participation is an expected part of this class, being especially valuable given the diverse nature of the students and the level of the material.

Conversion of numerical grades to letter grades

The Dalhousie Grade Scale is used for this class: A+ (90-100), A (85-89), A- (80-84), B+ (77-79), B (73-76), B- (70-72), C+ (65-69), C (60-64), D (50-54), and F (0-49).

Course Policies on Missed or Late Academic Requirements

A late fee of 15% per working day (defined by hours of service in the departmental office, prorated by hour) is applied to assignments, unless a “time out” period is justified by a Student Declaration of Absence form or other suitable means. Assignments are intended to encourage and display the understanding of individuals, not of groups.

Course Policies related to Academic Integrity

While students may find it helpful to discuss assignments with others, all submitted work is required to have been done by the individual student. The usual rules about plagiarism and other forms of cheating apply in this course, as they do throughout Dalhousie. The use of generative AI or similar technologies (e.g. chatGPT) for writing is forbidden for assignment preparation, although students may use AI tools to locate conventional resource materials such as research papers and textbooks.

Learning Objectives

Students should be able to describe the basic patterns of ocean properties and flow, to contextualize them in terms of physical laws, and to address applications to e.g. the atmosphere-ocean system and the biology and chemistry of the seas.

Course Content

In August-September of 2025, Dalhousie University locked out professors and cancelled classes, reducing the term length by approximately 25%. This will require changes in the course content, made in the context of the planned learning outcomes and the interests of students. The general themes are: **seawater properties** (characteristics of seawater, hydrographic patterns in the sea, etc); **dynamics** (concepts of fluid mechanics, including the Coriolis effect, the momentum and mass-conservation equations, Reynolds decomposition, basic numerical modelling, etc); and **applications** (air-sea fluxes, response to wind stress, gravity waves, geostrophy, large-scale current dynamics). These are the core elements. If time permits and depending on student interests (e.g. topics of Honours theses, career plans, etc), there may also be discussion of tides, estuarine and shelf circulation, global-scale circulation, and ocean mixing.

University Policies and Statements

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 at 1321 Edward St or elders@dal.ca. Additional information regarding the Indigenous Student Centre can be found at: https://www.dal.ca/campus_life/communities/indigenous.html

Internationalization. At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: <https://www.dal.ca/about-dal/internationalization.html>

Academic Integrity. At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all 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. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility. The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html).

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors,

and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

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 (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: <http://www.dal.ca/cultureofrespect.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. The full Code of Student Conduct can be found at: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at: https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at: https://www.dal.ca/dept/university_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.