

Biology of Phytoplankton Syllabus

Department of Oceanography

OCEA 4230/5230; BIOL/MARI 4662 Winter 2024

Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.

Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.

Course Instructor

Name	Email	Office Hours
Hugh MacIntyre	hugh.macintyre@dal.ca	Fridays 08:30–09:30, LSC 2633

Course Description

This is an upper-division course on the phytoplankton in the context of their evolutionary history and ecological diversity. It has an emphasis on their adaptations and acclimation to different environments and their role in food webs and biogeochemical cycling.

Course Prerequisites

MATH 1000.03 and 1010.03 or MATH 1215, OCEA 2001.03 and 2002.03; or permission of Instructor

Course Exclusions

N/A

Student Resources

Lectures, which include citations, will be posted on the course Brightspace page prior to each lecture.

Course Structure

Course Delivery

Delivery is in-person and students are expected to attend and engage with all lectures.

Lectures

Tue & Thu 10:00–11:30, Killam Library 4106

Laboratories

N/A

Tutorials

N/A

Course Materials

The course is taught from the primary literature. No textbook is required.

Assessment

Assignments

Concept Maps

Students will submit 5 concept maps (100–200 words), covering Units 3–10. The concept map is a detailed analogy of a structure, concept or relationship presented in the lectures. These will be due one week after the course unit on which they are based, tentatively Feb. 1, 15, Mar. 7, 14, and 28. Concept maps account for 30% of the final grade in OCEA 4230 & BIOL/MARI 4662, and 22% of the grade in OCEA 5230.

Students may drop one of the concept maps if the reweighted average improves their grade.

Numerical Assignments

Students will use the functional relationships presented in the course to calculate the effects of environmental conditions and interactions with co-occurring species on achieved growth rates in 2 modeling assignments, due on Feb. 1 and 29.

Numerical assignments account for 38% of the final grade in OCEA 4230 & BIOL/MARI 4662, and 32% of the grade in OCEA 5230.

Poster

Students will submit a summative assessment focusing on one species or genus of phytoplankton, based on the organizing theme of the course. The poster is due on Apr 11.

The poster account for 30% of the final grade in OCEA 4230 & BIOL/MARI 4662, and 24% of the grade in OCEA 5230.

Term Paper (OCEA 5230 only)

Students enrolled in the 5230 section of the class are required to write a short (1500-2000 word) term paper that reviews a topic of interest in the context of the material covered in the class. The subject of the paper will be chosen in discussion with the instructor. The paper is due on Apr 11. The term paper accounts for 20% of the grade in OCEA 5230.

Other course requirements

Participation in class accounts for 2% of the final grade. This will be assessed by the instructor based on recorded attendance and engagement with the material. Engagement will be assessed from participation in discussion in class. The default value is 0.

Conversion of numerical grades to final letter grades follows the

Dalhousie Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies on Missed or Late Academic Requirements

With the exception of attendance at lectures, all assessed materials will be available a minimum of 10 days prior to the submission date. Assignments will not be accepted after the submission deadline on Brightspace.

- Students should file a Student Declaration of Absence form for missed lectures (maximum 2) to avoid penalty for the engagement grade.
- There is no make-up for missed concept maps. Students have the option to drop the score for one if the reweighted average improves their grade.
- Students who fail to submit a numerical assignment or the summative assessment (poster and/or term paper) will be given the opportunity to take a written exam c. 1 hour in duration per assignment, to be administered by the instructor during the exam period. There will be no subsequent opportunity for make-up work if the exam is missed.

Course Policies related to Academic Integrity

Students are encouraged to discuss approaches to the numerical assignments and the poster but all work submitted for evaluation must be done by the student submitting it. (Note that the data inputs for the numerical assignments and the subject organisms for the poster are unique for each student in the course.)

Spreadsheets or code submitted in support of the numerical assignments' answers that has high similarity between different students' submissions will be taken as evidence of plagiarism and will be assigned a zero and/or referred to the Senate Discipline Committee.

Written materials (concept maps, poster, term paper) should be the students' own work and should not involve any use of generative AI and large language models (e.g., ChatGPT). Students submitting work that resembles AI-generated material will be asked to explain the concepts in person and in depth. An inability to do so will result in the work being assigned a zero. The student will have the option to write a substitute submission that is produced under exam conditions (i.e., supervised, handwritten on paper, without use of electronic devices except a calculator).

Students should cite the primary literature in their posters and term papers, with clear attribution. Submissions that are internally inconsistent in tone may be tested for matching with external sources using Urkund. Work showing evidence of plagiarism will be assigned a zero and/or referred to the Senate Discipline Committee.

Learning Objectives

On completion of the course, students should be able to identify the major radiations of phytoplankton; interpret remotely-sensed images of phytoplankton abundance and

productivity; and predict competitive success of phytoplankton with given physiological and behavioural traits under different environmental conditions.

Course Content

List the lecture topics along with an approximate schedule of their delivery.

(Optional but encouraged) Fill out the tentative course schedule to provide students with an expectation for all lessons and assessments throughout the term. Include the week and date the lesson or assessment takes place, the lesson topics or assessment type along with the reading associated with each date.

Week	Date	Lesson Topic(s)	Reading/Assessment
1	09-Jan	Unit 1: Orientation and overview	
1	11-Jan	Unit 1: Orientation and overview	
2	16-Jan	Unit 2: The marine environment	
2	18-Jan	Unit 3: Taxonomy: endosymbiosis, grazing, kleptochloroplasty and gene transfer	
3	23-Jan	Unit 3: Taxonomy: cyanobacteria & the "green" lineage	
3	25-Jan	Unit 3: Taxonomy: the "red" lineage	Numerical Assignment 1
4	30-Jan	Unit 4: Detection	
4	01-Feb	Unit 4: Detection	Concept Map 1 (Unit 2 & 3)
5	06-Feb	Unit 5: Photosynthesis and respiration: light and dark reactions	
5	08-Feb	Unit 5: Photosynthesis and respiration: photoacclimation & photoprotection	
6	13-Feb	Unit 6: Nutrient acquisition and assimilation: overview, kinetics and limitation vs starvation	
6	15-Feb	Unit 6: Nutrient acquisition and assimilation: C metabolism	Concept Map 2 (Unit 4 & 5)
	20-Feb	Reading Week	
	22-Feb	Reading Week	
7	27-Feb	Unit 6: Nutrient acquisition and assimilation: N metabolism	

7	29-Feb	Unit 6: Nutrient acquisition and assimilation: P and Fe metabolism	
8	05-Mar	Unit 7: Mixotrophy	Numerical Assignment 2
8	07-Mar	Unit 8: Thermal acclimation	Concept Map 3 (Unit 6)
9	12-Mar	Unit 9: Species interactions: mutualism, allelopathy & grazing	
9	14-Mar	Unit 9: Species interactions: mutualism, allelopathy & grazing	Concept Map 4 (Unit 7 & 8)
10	19-Mar	Unit 10: Cell losses: viral lysis	
10	21-Mar	Unit 10: Cell losses: programmed cell death and sinking	
11	26-Mar	Unit 11: Population dynamics: succession, bottom-up vs top-down control	
11	28-Mar	Unit 11: Population dynamics: ruderal niche (r-selected taxa)	Concept Map 5 (Unit 9 & 10)
12	02-Apr	Unit 11: Population dynamics: competitive niche (r- to K-selected taxa)	
12	04-Apr	Unit 11: Population dynamics: stress-tolerant niche (K-selected taxa)	
	11-Apr		Poster; term paper (OCEA 5230 only)

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) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (<https://www.dal.ca/about-dal/agricultural-campus/student-success-centre.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.