

# Biology of Phytoplankton Syllabus

## Department of Oceanography

OCEA 4230/5230, BIOL/MARI 4662 Winter 2026

*Dalhousie University operates in the unceded territories of the Mi'kmaw, Wolastoqey, and Peskotomuhkati Peoples. These sovereign nations hold inherent rights as the original peoples of these lands, and we each carry collective obligations under the Peace and Friendship Treaties. Section 35 of the Constitution Act, 1982, recognizes and affirms Aboriginal and Treaty rights in Canada.*

*We recognize that African Nova Scotians are a distinct people whose histories, legacies, and contributions have enriched the part of Mi'kma'ki known as Nova Scotia for over 400 years.*

### Course Instructor(s)

Name	Email	Office Hours
Hugh MacIntyre	<a href="mailto:hugh.macintyre@dal.ca">hugh.macintyre@dal.ca</a>	Fridays 08:30–09:30

### Course Description

This is an upper-division/graduate 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 14:30–16:00, LSC 3652.

### *Laboratories*

N/A.

### *Tutorials*

N/A.

## **Course Materials**

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

## Assessment

### *Assignments*

#### *Unit Tests*

- Weekly quizzes on Brightspace (10 total; 90-minute availability) will cover material from the previous week's lecture in both qualitative and **quantitative** format.
- Quizzes account for 28% of the grade (4000 section) or 21% of the grade (5000 section)
- Grades will be based to the 7 best submissions.
- Missed submissions will be assigned a score of zero.

#### *Concept Map Critiques*

- Students will submit 3 critiques of AI-generated concept maps, covering Units 2-9, on Brightspace. 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 last unit on which they are based, tentatively Feb. 10, Mar. 10, and Mar. 31.
- The wording for each AI prompt is identical except for 5-6 key terms chosen by the student. The submission portal will be available for 10 days to facilitate submission around students' other commitments.
- Concept map critiques account for 35% of the grade (4000 section) or 28% of the grade (5000 section).
- Missed submissions will be assigned a score of zero.

#### *Summative Assessment (Poster)*

- The summative assessment is a poster that will summarize the niche occupied by one taxon of phytoplankton, with a description of the traits that give it a competitive advantage in that niche and a prediction of whether the niche will expand or contract with global warming.
- The requirements and rubric for the poster will be available at least one month before the submission deadline.
- The poster accounts for 35% of the grade (4000 section) or 28% of the grade (5000 section).
- Missed submissions will be assigned a score of zero

#### *Term Paper (5000 section only)*

- Students enrolled in the 5000 section of the class are required to write a 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 accounts for 20% of the grade (5000 section only).

### *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 or in office hours. The default value is zero.

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**

- Students should file a Student Declaration of Absence form for missed lectures (maximum 2) to avoid penalty for the engagement grade.
- Assignments will not be accepted after the submission deadline on Brightspace.
- Students at risk of failing because they have not submitted assignments will be referred to the Assistant Dean for Students, Faculty of Science.

### **Course Policies related to Academic Integrity**

Students are encouraged to discuss approaches to assignments but all work submitted for evaluation must be done by the student submitting it. **Students should not use generative AI and large language models (e.g., ChatGPT) for assignments except where explicitly directed to do so (the Concept Map Critiques).** Careful attention to the critiques should be persuasive that using LLMs is unlikely to result in work that meets the standard expected in the class.

### **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 behavioral traits under different environmental conditions. If you have read this far by the first Unit 3 class, email the instructor with the phrase “It isnae a brow bricht moonlicht nicht the nicht” in the subject line.

## Course Content

The tentative course schedule is as follows.

Date	Unit Topic(s)	Assessment
08-Jan	Unit 1: Orientation and overview	
13-Jan	Unit 2: The marine environment	
15-Jan	Unit 2: The marine environment	
20-Jan	Unit 3: Endosymbioses (grazing, kleptochloroplasty and gene transfer)	Unit Test 1
22-Jan	Unit 3: Major groups of phytoplankton (cyanobacteria & the "green" lineage)	
27-Jan	Unit 3: Major groups of phytoplankton (the "red" lineage)	Unit Test 2
29-Jan	Unit 4: Detection	
03-Feb	Unit 4: Detection	Unit Test 3
05-Feb	Unit 5: Photosynthesis, respiration and growth (light and dark reactions)	
10-Feb	Unit 5: Photosynthesis, respiration and growth (photoacclimation & photoprotection)	Concept Map 1 (Unit 2-4); Unit Test 4
12-Feb	Unit 6: Nutrient acquisition and assimilation: overview, kinetics and limitation vs starvation	
17-Feb	Unit 6: Nutrient acquisition and assimilation: C metabolism	Unit Test 5
19-Feb	Reading Week	
24-Feb	Reading Week	
26-Feb	Unit 6: Nutrient acquisition and assimilation: N metabolism	
03-Mar	Unit 7: Thermal acclimation	Unit Test 6
05-Mar	Unit 8: Species interactions: mixotrophy	
10-Mar	Unit 8: Species interactions: grazing	Concept Map 2 (Unit 5-7); Unit Test 7
12-Mar	Unit 8: Species interactions: mutualism and allelopathy	
17-Mar	Unit 8: Species interactions: mutualism and allelopathy	Unit Test 8

19-Mar	Unit 9: Cell losses: viral lysis, programmed cell death and sinking	
24-Mar	Unit 9: Cell losses: viral lysis, programmed cell death and sinking	Unit Test 9
26-Mar	Unit 10: Population dynamics: succession, bottom-up vs top-down	
31-Mar	Unit 10: Population dynamics: ruderal niche (r-selected taxa)	Concept Map 3 (Unit 8-9); Unit Test 10
02-Apr	Unit 10: Population dynamics: competitive niche (r- to K-selected taxa)	
07-Apr	Unit 10: Population dynamics: stress-tolerant niche (K-selected taxa)	
14-Apr		Summative Assessments (Posters) due; Term Papers due (5000 Section 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](mailto:elders@dal.ca). Additional information regarding Mi'kmaq and Indigenous Relations (including the Elders in Residence program, Land Acknowledgements, Understanding Our Roots, and much more) can be found at: <https://www.dal.ca/about/mission-vision-values/mikmaq-indigenous-relations.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/mission-vision-values/global-relations.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](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](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/campus\\_life/ssc.html](https://www.dal.ca/campus_life/ssc.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: <https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion.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/content/dam/www/about/leadership-and-governance/governing-bodies/code-student-conduct.pdf>

## **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/content/dam/www/about/leadership-and-governance/university-policies/fair-dealing-policy.pdf>

## **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.