

Syllabus:

***Hacking the blue planet: the scientific and social dimensions of
ocean fertilization***

MARI/OCEA 4665 BIOL/OCEA 5665

M/W 13:05-14:25 LSC-COMMON AREA C234

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. This means that we all benefit from these treaties and are on and of this land through them.

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

This course seeks to recognize and understand different perspectives, including those of the Mi'kmaq People and African Nova Scotians, on locally and globally significant environmental issues.

Instructor: Erin Bertrand (she/her) erin.bertrand@dal.ca Office: LSC BIOL 5076B

Lectures: Three lecture hours per week

Office Hours: By appointment; email to arrange

Course Description

This course explores the biology, ecology, biogeochemistry and ethical and legal dimensions of purposeful ocean fertilization. Through lectures, discussion, case studies, and group projects, students consider the biological and oceanographic basis of ocean fertilization and its use as a 1) scientific tool and 2) controversial geoengineering strategy for climate change mitigation. Students will also consider ocean fertilization in context with very recent developments in other ocean-based climate engineering strategies.

In the 1980's, the scientific community began discussing the possibility that purposeful ocean fertilization could cause large-scale phytoplankton blooms with the potential to influence climate. Open ocean iron fertilization experiments began in the early 1990's and have continued into the current decade. These iron additions often resulted in large phytoplankton blooms, but the fate of the resulting biomass remained unclear. Ocean fertilization has been surrounded by scientific, ethical and legal controversies. It has received attention as a potential climate change mitigation strategy, a tool for basic oceanography research, and even as a method for revitalizing fish stocks. In this class, ocean fertilization will be used as a starting point from which to teach concepts including ecological stoichiometry, planktonic ecosystem structure and function, as well as order of magnitude calculations. The course will then bridge from biophysical sciences into the social realm, and students will use the knowledge they've gained about relevant biology and oceanography to evaluate various claims about

ocean fertilization as a climate and fisheries engineering strategy, and to compare it to other ocean-based climate engineering strategies. Through case study discussions, the class will explore the ethical and legal dimensions of such engineering strategies. This course will expose students to structured reading, discussion and synthesis of primary literature and will provide opportunities for improving cross-disciplinary communication, writing, and critical thinking skills.

Course Prerequisites

For 4665.03: one of the following: BIOL 3101.03, OCEA 2000X/Y.06, EARTH 3601.03, BIOL 3060.03 or Instructor's permission

For 5665: Instructor's permission

Key knowledge or skills expected of students coming into the course

Students will be expected to have a very basic understanding of planktonic marine ecosystems. This class, however, will be suitable for students with a wide range of backgrounds since it explores inherently interdisciplinary topics.

Course Objectives:

Students will come away from this class being able to discuss:

- *The roles of ocean biology in shaping global climate*
- *The concept of ecological stoichiometry and its implications for marine sciences*
Ecological stoichiometry: the notion that observed patterns in biochemical use of elements at the molecular level may be directly connected with phenomena at the ecosystem or even global level
- *The nature of conflicts that arise at the intersection of basic research and applied science*
- *Ethical, legal, and policy implications of ecosystem and geoengineering schemes*

Students will have gained practical experience in:

- *Synthesizing and interpreting primary literature*
- *Making order of magnitude calculations and estimations to arrive at approximate solutions to complex problems*
- *Writing, peer reviewing, and presenting a formal research proposal*
- *Working in interdisciplinary teams*

Course Materials

All materials will be made available via the course Brightspace page. These include primary literature and perspective pieces from scientific journals as well as select chapters from textbooks including:

- *Sterner and Elser, Ecological Stoichiometry*
- *Harte, Consider a Spherical Cow*
- *Frausto da Silva and Williams, Biological Chemistry of the Elements*
- *Libes, Marine Biogeochemistry*

Course Format: Approximately half of the class periods will be comprised of lecture and group discussions led by the instructor (denoted as * in the schedule). To prepare for these class periods, students will be expected to have read 1-2 assigned pieces which could be book chapters, primary literature, review articles, or opinion pieces from the literature. The other half will be asynchronous and comprised of structured group work (denoted as # in the schedule and based on 1-2 assigned readings) or will be student-led discussions, with 2-3 Peer Discussion Leaders designated (denoted as \$ in the

schedule) which will also be focused on 1-2 assigned readings, which all students are expected to have worked through ahead of the class period.

Readings for each class will be available one week ahead of time on the course Brightspace page.

A particularly excellent web-based resource for content on ocean iron fertilization is:

<https://web.whoi.edu/ocb-fert/>

Course Content and Schedule

(schedule is subject to change; consult Brightspace regularly for updates and details)

(*Instructor led, #Asynchronous group work, \$student-led)

Wed Sept 4*, Mon Sept 9*: History of ocean fertilization, climate crisis and ocean-based geoengineering in context. Course overview.

Wed Sept 11*, Mon Sept 16\$: Phytoplankton physiology, ecological stoichiometry, and nutrient acquisition

Wed Sept 18# Asynchronous meeting- group work on geoengineering in the news

Mon Sept 23*, Wed Sept 25\$: Microbial loop, biological pump

Mon Sept 30: National Day for Truth and Reconciliation- University Closed

Wed Oct 2*: Unintended consequences of OIF, Results of OIF experiments to date

Mon Oct 7*, Wed Oct 9\$: Paleoceanographic Perspectives

Mon Oct 14: Thanksgiving- University Closed

Wed Oct 16*: Writing and reviewing research proposals; Proposal Topic Workshop

Mon Oct 21\$, Wed Oct 23* **Case Study 1**: LOHAFEX and international governance; Other ocean-based geoengineering schemes

Mon Oct 28*, Wed Oct 30\$: Geoengineering Governance

Mon Nov 4, Wed Nov 6: Ethics and Geoengineering

Mon Nov 11, Wed Nov 13: Fall Study Break

Mon Nov 18\$, Wed Nov 20\$: **Case Study 2**: Haida Salmon Restoration Corporation **Case Study 3**: Oceaneos (*Instructor will be remote for these classes*)

Mon Nov 25\$, Wed Nov 27\$: **Case Studies 4, 5**: Current Events in Ocean-based climate engineering

Mon Dec 2, Tues Dec 3 and Wed Dec 6: **Proposal Presentations**

Course Assessment

Component	Weight (% of final grade)	Due Date
Problem Sets (2)	25%	Wed Oct 9 (Assigned Sept 25) and Wed Nov 20 (Assigned Nov 6)
Self and Peer Evaluations	20%	
Personal Reflections	15%	Thurs Oct 3, Thurs Oct 31, Thurs Nov 28
Discussion-leading and participation	15%	
Research proposal	25%	Dec 13- see below for additional deadlines

Problem Sets (25%) Two equally weighted take-home problem sets including calculations and short answer questions on the following topics:

1. Phytoplankton stoichiometry, microbial loop, biological pump
2. Synthesis: where natural science meets policy, legal, and ethical dimensions of eco- and geoengineering schemes

Problem set policies: Students are free to work together and to use any lecture, course or other resources to work on these problems. If you work with another student or receive help from some other living resource, *include their name at the top of your problem set*. Problem sets will be assigned two full weeks before they are due but should not take you more than 8h total to complete. Show all your work in submitted documents. Problem sets must be uploaded to Brightspace by the due date and must ALSO be handed in, on paper, during the next class period.

Peer and Self Evaluations (20%): Each class period, students will work in small groups (3-4 people) to discuss assigned readings and address specific questions provided by the instructor. At the end of each period, students will evaluate their own contributions and the contributions of their peers by filling out a survey about each student they work with that day and about themselves, answering the following questions yes or no:

1. The team member was well prepared and did their best to understand the material
2. The team member made a good effort to participate
3. The team member was willing to consider and respect other's ideas and opinions
4. The team member enhanced everyone's understanding of how the readings relate to the broad themes of the course
5. The team member helped me think differently about the material (or if self- I changed the way I think about the materials based on other team members' perspectives)
6. Overall the quality of the team member's contribution was very good- excellent

These answers will be used by the instructor to assign grades to each student according to the following scheme:

Peer and Self-Evaluation grading criteria:

Criteria For	Indicators
Undergraduates	The student demonstrates that they: <ul style="list-style-type: none"> • have completed the assigned reading (60%) • have developed an understanding of how these readings relate to broad themes in the course (30%) • identify key weaknesses or raise insightful questions when readings include primary scientific literature (10%)
Graduate Students	The student demonstrates that they: <ul style="list-style-type: none"> • have completed the assigned reading (40%) • have developed an understanding of how these readings relate to broad themes in the course (30%) • identify key weaknesses or raise insightful questions when readings include primary scientific literature (30%)

Personal Reflections (15%) This assignment is designed to students improve their writing skills and help them synthesize complex material. In 400-600 word essays, students will provide personal reflections on their thoughts and feelings surrounding the course material presented thus far. More specific prompts may be provided ahead of time for each essay.

Personal reflection grading criteria:

Criteria For	Indicators
Undergraduates	The student demonstrates that they: <ul style="list-style-type: none"> • have completed the assigned reading (50%) • have developed an understanding of how these readings relate to broad themes in the course (30%) • have thought synthetically about the material presented (10%) • have improved their writing based on feedback from earlier personal reflections (10%)
Graduate Students	The student demonstrates that they:

	<ul style="list-style-type: none"> • have completed the assigned reading (30%) • have developed an understanding of how these readings relate to broad themes in the course (20%) • have thought synthetically about the material presented (25%) • have improved their writing based on feedback from earlier personal reflections (25%)
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Discussion Leading and Class Participation (15%) Students are expected to attend and participate in all classes and to effectively lead discussion on their assigned day.

Discussion leader responsibilities: Peer discussion leaders should come to class prepared to co-lead discussion on the assigned readings for the week on their assigned days. This could consist of preparation of slides to highlight key figures or points, discussion questions, or prepared activities. Each class period should include some small group work on which peer and self evaluations can be based (evaluations described below). Leaders for each day should get together to discuss and plan ahead of class such that each co-leader participates. I am available and happy to discuss planned activities.

Discussion leading and participation evaluation rubric:

Criteria	Indicators
Discussion leading (40%)	The student came well-prepared to lead discussion at the allotted time and effectively facilitated an active discussion
Frequency of participation in discussions (25%)	The student is actively engaged in class discussion at all times.
Quality of contributions (35%)	The student's comments are constructive and relevant; comments reflect a considered understanding of the week's reading materials and course aims.

Research Proposal (25%) Undergraduates in groups of 2-3 students, or graduate students as individuals: propose a research project to answer what you perceive to be a remaining key question about ocean fertilization, another aspect of ecological stoichiometry, or geoengineering more generally. The question can be a basic science question or one that bridges the social and biophysical sciences. Proposals will be 7-10 pages single spaced including figures and tables, and excluding references. Each student will individually review one other draft proposal. Each proposal will also be presented and defended in a 15-minute oral presentation with 5 minutes for questions. Principles of peer review and proposal writing will be discussed in class. All students must also submit individual reflections on their proposal experience, which the instructor will use to evaluate all student's roles in the project and assign a portion of the grade based on the quality of each student's individual contributions. Each component

will be submitted via Brightspace; paper copies are not required but will be accepted in addition to Brightspace uploads.

Proposal Due Dates and Marking Scheme:

- 5% Proposal topic and one-paragraph summary due Oct 25
- 15% 1st draft of proposal due Nov 8
- 20% Peer review of other group’s proposals due Nov 22
- 20% Presentation- Dec 2, 3, or 4
- 20% Final proposal due Dec 13
- 20% Reflections and Contributions to the Group due Dec 16

Draft Proposal Marking Rubric

Criteria	Indicators
Format (20%)	Follows page length, spacing guidelines. Citations are properly formatted and consistent. Students may choose any citation format employed by a journal they cite in their proposal.
Clarity (30 %)	The proposal should be written for a scientifically- literate but non-specialist audience. The writing style is clear, focused and does not employ large amounts of technical jargon.
Innovation (30%)	The proposal identifies an outstanding problem or question and articulates a useful and innovative approach to solving that problem or answering that question.
Support (20%)	The proposal cites and synthesizes appropriate literature to support the topic choice and effectively places the proposal topic in context with current knowns and unknowns while avoiding plagiarism.

Final Proposal Marking Rubric

Criteria	Indicators
Format (15%)	Follows page length, spacing guidelines. Citations are properly formatted and consistent. Students may choose any citation format employed by a journal they cite in their proposal.
Clarity (25 %)	The proposal should be written for a scientifically- literate but non-specialist audience. The writing style is clear, focused and does not employ large amounts of technical jargon.
Innovation (25%)	The proposal identifies an outstanding problem or question and articulates a useful and innovative approach to solving that problem or answering that question.
Support (15%)	The proposal cites and synthesizes appropriate literature to support the topic choice and effectively places the proposal topic in context with current knowns and unknowns while avoiding plagiarism.
Revision (20%)	Productively incorporates constructive criticism given by instructor and peer reviewer into an improved final proposal submission.

Peer Review Marking Rubric

Criteria	Indicators
Format (25%)	Adheres to the guidelines and evaluation criteria provided.
Constructive feedback (75%)	Clearly and constructively identifies areas in which the proposal can be improved, either in content or in presentation.

Presentation Marking Rubric

Criteria	Indicators
Format (25%)	Adheres to time limit guidelines for both presentation and question and answer period.
Clarity of oral presentation (25%)	Presents the problem/ question, its significance, the approach taken and the expected outcomes clearly for a scientifically literate but non-specialist audience.
Clarity of slides (25%)	Effectively uses figures, images, and minimal text on slides for the purpose of enhancing the clarity of the presentation.
Responses to questions (25%)	Demonstrates a clear understanding of the topic of discussion in responses to questions.

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)	

NOTE THAT GRADUATE STUDENTS REQUIRE A B- (70%) OR BETTER TO PASS

Evaluation Definitions and Schema: In addition to the rubrics provided above, which articulate the criteria evaluated in each assignment, students should be aware of the definitions and evaluation schema that will be used for assigning numerical grades to written assignments and presentations:

Grade	Point	%	Definition	Notes
A+	4.3	90-100	Exceptional	Exceptional work- exceeds expectations; high order, original thinking, research, critical evaluation skills; extraordinary analysis and synthesis skills; excellent grasp of subject matter and command of relevant literature
A	4.0	85-89	Excellent	High order, original thinking, research and critical evaluations skills; excellent analysis and synthesis skills; excellent grasp of subject matter and command of relevant literature
A-	3.7	80-84	Very Good	Evidence of strong original thinking, research and critical evaluations skills; very good analysis and synthesis skills; very good grasp of subject matter and command of relevant literature
B+	3.3	77-79		
B	3.0	73-76	Good	Evidence of some original thinking, research and critical evaluations skills; sufficient analysis and synthesis skills; good grasp of subject matter and command of relevant literature
B-	2.7	70-72		

F	0	0-69	Failure	Insufficient evidence of original thinking, research and critical evaluations skills; poor grasp of subject matter and command of relevant literature or failure to complete assignments on time or according to course specification
INC			Incomplete	Extensions available only in exceptional circumstances
ILL			Illness, compassionate reasons	Documentation must be submitted to instructor within one week of due date
W			Withdrew after deadline	Registrar assigns this

Course Policies

Complete attendance of all lectures is highly recommended, and class participation is key. In recognition that things come up that will prevent you from always being in class, the three lowest peer and self evaluation scores will be dropped.

SDA's are not used in this class.

Late assignments: I apply an automatic 6-hour grace period to all assignments. You do not need to check with me about whether this will apply to you- this applies no questions asked. Beyond this, I will apply a 10% reduction in grade for every day an assignment is late. I will consider extenuating circumstances: contact me as soon as possible, within one week of the assignment due date, to discuss a path forward.

Due Date Flexibility: If you foresee a conflict with a due date for a major assignment with an important cultural or academic event, please let me know as soon as possible and we'll work together to find a good solution. Communication is key- I will be as flexible as possible but need to plan alternative dates in advance.

Assignment submission: Assignments should be submitted via Brightspace with the following file naming format: Jane Doe, problem set 1, submission date Sept 27th 2016: File name: JDoe_PS1_20240927

Problem set policies: Students are free to work together and to use any lecture, course or other resources to work on these problems. If you work with another student or receive help from some other living resource, *include their name at the top of your problem set*. Problem sets will be assigned two full weeks before they are due but should not take you more than 8h total to complete. Show all your work in submitted documents. Problem sets must be uploaded to Brightspace by the due date and must ALSO be handed in, on paper, during the next class period.

Brightspace will be used for regular updates and announcements; students are responsible for regularly monitoring this space.

Email expectations: I regularly answer email between 8:15-17:00 on weekdays and intermittently on evenings and weekends. Please do not expect regular email responses outside of these hours, and I will do my best to respond to all emails as soon as possible within these hours, usually within 48h.

There are more ways of learning and knowing than through what is currently acknowledged as formal learning through degree-granting institutions. This course aims to respect and consider these ways of knowing.

Group work: I expect that everyone will bring their best, good faith effort and a spirit of learning and collaboration to all group work. If you are facing difficulties or conflicts in group work and would like to discuss strategies for working to overcome them, please see me.

An inclusive learning environment: I am committed to creating an inclusive and respectful learning environment for everyone. I understand that some students face unseen barriers. I am willing to listen and learn about such barriers and accommodate accordingly. Please see me as soon as possible to discuss.

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/about/leadership-governance/academic-integrity/faculty-resources/ouriginal-plagiarism-detection.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.

University Policies and Programs

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

http://www.dal.ca/academics/important_dates.html

Classroom Recording Protocol:

https://www.dal.ca/dept/university_secretariat/policies/academic/classroom-recording-protocol.html

Dalhousie Grading Practices Policies:

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

Grade Appeal Process: https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html

Sexualized Violence Policy: https://www.dal.ca/dept/university_secretariat/policies/health-and-safety/sexualized-violence-policy.html

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

Learning and Support Resources

General Academic Support – Advising (Halifax): https://www.dal.ca/campus_life/academic-support/advising.html

General Academic Support – Advising (Truro): <https://www.dal.ca/about-dal/agricultural-campus/ssc/academic-support/advising.html>

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

On Track (helps you transition into university, and supports you through your first year at Dalhousie and beyond): https://www.dal.ca/campus_life/academic-support/On-track.html

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

Indigenous Connection: <https://www.dal.ca/about-dal/indigenous-connection.html>

Elders-in-Residence (The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit the office in the Indigenous Student Centre or contact the program at elders@dal.ca or 902-494-6803:

<https://cdn.dal.ca/content/dam/dalhousie/pdf/academics/UG/indigenous-studies/Elder-Protocol-July2018.pdf>

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

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

LGBTQ2SIA+ Collaborative: <https://www.dal.ca/dept/vpei/edia/education/community-specific-spaces/LGBTQ2SIA-collaborative.html>

Dalhousie Libraries: <http://libraries.dal.ca/>

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

Dalhousie Student Advocacy Services: <https://www.dsu.ca/dsas?rq=student%20advocacy>

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

Human Rights and Equity Services: <https://www.dal.ca/dept/hres.html>

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

Study Skills/Tutoring: http://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Faculty of Science Advising Support: <https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html>

Safety

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

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

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

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