DALHOUSIE UNIVERSITY

Faculty of Science and Faculty of Graduate Studies Course Syllabus
Department of Biology

MARI 3602.03 — BIOL 5602.03
Introduction to Aquaculture
Winter 2022

Instructor: Dr. Diego Ibarra | email: Diego.Ibarra@dal.ca | Office: LSC-3625 (Oceanography)
Questions MUST be posted in Brightspace's Discussion boards (see guidelines below). Only use email for private/personal matters.

Lectures/labs: Tuesdays and Thursdays 4:05 pm-5:25 pm | *Location:* HENRY HICKS ACADEMIC 212

Course delivery: In-person or online

TA: Raven Vansickle | email: Raven.Vansickle@dal.ca

Time zone: All times (syllabus, Brightspace, calendar, etc.) are in **Halifax Time (ADT/UTC-3 or AST/UTC-4)**

Course Description
This course offers a lecture-based introductory overview of aquaculture; the culturing and rearing of aquatic plants and animals. Lectures will deal with the following topics: (1) general overview of aquaculture; (2) physical and chemical properties of the aquatic environment; (3) site selection; (4) aquatic engineering; (5) aquaculture modeling; (6) finfish culture; (7) bivalve culture; (8) crustacean culture; (9) seaweed culture; (10) health and pathology; (11) growth and nutrition; (12) genetics and reproduction; (13) legal, economic, social and environmental considerations; (14) sustainability issues. These topics will be covered with both a Maritimes and a global perspective.

This course is designed to familiarize students with the multi-disciplinary nature of aquaculture as a field. The introduction will describe the state of aquaculture production in the world. The main body of the course is divided in three sections covering the aquatic milieu, species specific culture techniques, and general biological principles. The amount of interplay between various physical, biological and species-specific aspects will be shown in each topic. We will overview legal, economic and social considerations and we will look at some of the controversies surrounding aquaculture environmental sustainability. This is an introductory class, and most topics will not be covered in fine detail. However, I expect student to get a clear appreciation of the underlying principles of aquaculture and how these come into play in chosen examples of aquaculture practices.

Course format
This course will start delivered online, mainly using Brightspace and zoom. However, we hope to switch to a face-to-face format if (and when) the COVID19 pandemic allows us to do so.

When online:

- **Asynchronous lectures and quizzes (required)** are delivered online (via Brightspace) under an asynchronous format, so that students can access course elements at their convenience. Lectures are released weekly. Quizzes are also released weekly but are only available for a 24-hour period.
- **Synchronous midterms and final exams (required).** There are three required exams that must be done at specific date/times (see schedule for details).

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- **Zoom synchronous conversations (not required).** There are weekly conversations (Tuesdays and Thursdays @ 4:05 pm Halifax Time) where the class can meet (via zoom, link in Brightspace) to ask questions, spark discussion and interact with each other. Students are encouraged, **but not required**, to attend to these sessions. **These synchronous events will NOT be recorded.** During these video-calls, please follow the etiquette below:
    - You are expected to have your **CAMERA AWAYS ON** when in the zoom room, therefore:
        - Be mindful of your clothing and appearance
        - Be mindful of your background (virtual backgrounds are ok)
        - Silence your cellphone and other electronic devices
        - Advise your roommates about your video-call so they are also mindful too
    - Keep you **MICROPHONE ALWAYS MUTED**, unless you need to speak

Course Prerequisites

Undergraduate	Graduate
BIOL 2003.03 – Animal Diversity **OR** Instructor's approval	Instructor's approval

Course Objectives/Learning Outcomes

- Describe the historical and current state of aquaculture in the world
- Describe the basic physical-chemical parameters of water that are relevant to aquaculture
- Explain current culture systems and associated basic engineering aspects
- Characterize the biology and culture of 8 major groups of cultured aquatic organisms
- Explain basic reproductive physiology and the application of genetic tools to aquaculture
- Identify the important macro and micronutrients relevant to fish nutrition and feed formulation
- States the main factors related to aquatic health and disease and their interplay
- Describe the main economic, legal and social contexts associated with aquaculture
- Discuss the various point of views related to aquaculture environmental impacts and sustainability
- Extract information from relevant aquaculture-related sources for presentation (Class presentation)

Course Materials

Textbook (optional):

- Aquaculture. Farming Aquatic Animals and Plants. 2nd edition 2012. J. Lucas and P. Southgate (Editors), 629 pp.

  OR
- Aquaculture. Farming Aquatic Animals and Plants. 2003, J. Lucas and P. Southgate (Editors), 502 pp.

Class notes: Class notes are posted on Brightspace.

Announcements: Electronic announcements and additional material will be posted on Brightspace. Students should check the site frequently.

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Other useful reading material:

Encyclopedia of Aquaculture. (2000). R. Stickney (Editor) *This is an excellent and relatively up-to-date source of information.	SH 20.3 E53
Principles of Aquaculture. R Stickney	SH 135 S74 1994
Introduction to aquaculture. M. Landau	SH 135 L36 1992
Ecological Aquaculture. The evolution of the blue revolution B. Costa-Pierce	SH 135 E35 2002
Cold-water aquaculture in Atlantic Canada A. Boghen	SH 37 C64 1995

Course Assessment

Component	Weight (% of final grade)		Date
	Undergraduate	Graduate	
Weekly Quizzes	50	30	See schedule below
Midterm exam 1	15	10	See schedule below
Midterm exam 2	15	10	See schedule below
Final exam	20	20	Determined by Registrars Office
Participation in Discussion Boards	1% bonus	1% bonus	Continuously
Aquaculture outreach video*	3% bonus	3% bonus	To be determined
Research paper	-	30	One week after final exam @ 11:59 pm
TOTAL	/100	/100	

** Team component*

Weekly Quizzes

Quizzes are designed to test you on the material from lectures. Quizzes are online (approx. 10 minutes) and are applied via Brightspace with *LockDown Browser* (i.e., prevents other software to run in your laptop during the exam) and *Respondus monitor* (uses your laptop's webcam to record your quiz session and flags any suspicious behavior). Each quiz will be available for 24 hours (see specific due dates in the schedule below). Students can answer the quiz at anytime during those 24 hours; however, there is set amount of time to answer the quiz once it is started, and there is only one attempt. Students are **required** to make and use a **hand-written "cheat-sheet"** for each Quiz. **A photo of the cheat-sheet must be uploaded to its corresponding Brightspace dropbox BEFORE you do the quiz.** Cheat-sheets not meeting specifications (see below) will result in a zero grade on the corresponding quiz.

Cheat-sheet specifications:

- Cheat-sheets are personal. **Copying somebody else's cheat-sheet is a serious plagiarism offence** requiring the Instructor to report all involved parties to the Academic Integrity Office.
- Cheat-sheets **MUST** be hand-written on paper. Digitization, electronic manipulation, photocopying, photographing and/or printing of cheat-sheets is not allowed.
- On your cheat-sheet, write your name, B00 number, date and Quiz number
- Size: each cheat-sheet is limited to one side of a letter-sized sheet of paper.
- Content: Anything you want, but **must** demonstrate an effort to synthetize lecture content.

Missed quizzes. There are no makeup quizzes. However, the quiz with the lowest mark will be automatically dropped so that it does not count towards the final grade. Therefore, students can miss **one** quiz during the course (for any reason) without any penalty. Students that enrol late can get exemptions for the quizzes missed before they enrolled to the class (up to two weeks from the start of class). Students with prolonged absence

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(more than a few days) due to illness, family matters and other extenuating circumstances, **please email both, the TA and the Instructor, briefly explaining your circumstance and dates,** and fill in a Student Declaration of Absence (SDA) form and upload it to the Brightspace Dropbox designated for SDAs. Students with an Accessibility or Accommodation Plan in place do not need to submit SDA form.

Midterms and Final exam

These exams are online via Brightspace with *LockDown Browser* (i.e., prevents other software to run in your laptop during the exam) and *Respondus monitor* (uses your laptop's webcam to record your quiz session and flags any suspicious behavior). The format is multiple choice and/or short answers. You **are allowed** to use your cheat-sheets during these exams. These exams will be synchronous. Date/time of the midterm is shown in the schedule below. For Final exam, date/time will be determined later by the Registrars Office.

The exams will include material from the lectures, quizzes, and discussion boards. Midterm 1 will include content from the beginning of the course and up to the material covered on the week of the Midterm 1 exam. Midterm 2 will include content covered after Midterm 1 and up to the material covered on the week of the Midterm 2 exam. The Final Exam will include all the material included in the course.

Missed exams: In extenuating circumstances, a make up exam may be scheduled for students that cannot take the exam at the normal date/time (note: heavy course load and travel are not normally considered extenuating circumstances). Students are strongly encouraged to notify the instructor of any conflict well in advance of the start of the normal exam. Make up exams are commonly scheduled before the date/time of the regularly scheduled exam. There is usually only one make up exam. For midterm exams, students that cannot attend neither the regularly scheduled exam nor the makeup exam, the weight of the missed midterm will be added to the weight of the final exam.

Participation in Discussion Boards

You are expected to contribute to the discussion boards (questions **AND ANSWERS**). Please follow the posting guidelines below:

- Before you post your question, **CHECK** if the question has already been asked/answered
- Post only ONE question per post. If you have multiple questions, post them in separate posts
- The post's TITLE should be your question
- If you know the answer to a question, please help by answering the post
- Be respectful and polite

Participation grades will be computed at the end of the course. First, *engagement points* (see below) will be tallied for each student. Then, a curve will be calculated (after removing outliers) to compute the participation bonus points for each student.

Item	Score (units: engagement points)
New question	1
Already posted question	0 for the first 3 events, -1 for additional events
Correct answer	1
Partially correct answer	0.5
Incorrect answer	0 for the first 3 events, -1 for additional events
Useful comment or sharing a link to a useful resource	1
Using offensive tone or language	-1

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Aquaculture outreach video

For bonus points, teams of students (maximum 3 students per team) need to make an outreach video related to aquaculture. The specific topics as well as procedures to do the video will be explained in a separate document.

Research paper (Graduate students only)

Each graduate student needs to prepare a *Literature Review* "manuscript" following the "Review Articles" guidelines in the "Guide for Authors" from the journal Aquaculture. The manuscript must provide objective critical evaluation of the subject. It cannot consist solely of a summary of the available literature. Evaluation of the quality of existing data, the status of knowledge, and the research required to advance knowledge of the subject are essential.

Students are encouraged to discuss their interests and propose subject ideas to the instructor. However, the subject of the review will ultimately be appointed by the instructor. If the student is registered for the *Graduate Certificate in Aquaculture*, the subject of the review must also be approved by the Certificate Coordinator.

Rubric: Research paper

Component		Comments	Weight (%)
Format		Manuscript must follow the formatting guidelines from the "Guide for Authors – Type of paper: Review Articles" from the journal Aquaculture https://www.elsevier.com/journals/aquaculture/0044-8486/guide-for-authors	5%
Clarity		Writing style must be clear and concise. The main content must be divided using headings carefully chosen to assist the reader to understand the content	10%
Critical thinking		The manuscript cannot be a simple summary of literature. Students must demonstrate the ability to evaluate the quality of the available knowledge and to provide suggestions for further advance the subject	10%
Content	Title	Follow instructions in "Guide for Authors – Type of paper: Review Articles" from the journal Aquaculture. https://www.elsevier.com/journals/aquaculture/0044-8486/guide-for-authors	5%
	Abstract		10%
	Table of contents		5%
	Introduction		5%
	Content sections		30%
	Conclusions		10%
	References		10%
		TOTAL:	100%

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Conversion of numerical grades to Final Letter Grades

Undergraduate students follow the Dalhousie Common Grade Scale. Graduate students follow a stricter scale, where a minimum of 70% (B-) is required to pass.

	Undergraduate			Graduate		
%	Letter Grade	Grade Point Value	Definition	Letter Grade	Grade Point Value	Definition
90 - 100	**A+**	4.30	Exceptional	**A+**	4.30	Exceptional
85-89	**A**	4.00	Excellent	**A**	4.00	Excellent
80-84	**A-**	3.70	Very Good	**A-**	3.70	Very Good
77-79	**B+**	3.30		**B+**	3.30	
73-76	**B**	3.00	Good	**B**	3.00	Good
70-72	**B-**	2.70		**B-**	2.70	
65-69	**C+**	2.30	Satisfactory	**F**	0.00	Failure
60-64	**C**	2.00		**F**		
55-59	**C-**	1.70		**F**		
50-54	**D**	1.00	Marginal Pass	**F**		
<50	**F**	0.00	Failure	**F**		

Course Policies

Questions. All questions MUST be posted in Brightspace's Discussion boards (see posting guidelines above). Only use email for private/personal matters.

Missing or late academic requirements. If you qualify for a quiz exemption or a make up exam (see policies in Course Assessment section above), please:

- Email **both**, the TA and the Instructor, briefly explaining your circumstance and dates.
- Fill in a Student Declaration of Absence (SDA) form and upload it to the Brightspace Dropbox designated for SDAs.
- Students with an Accessibility or Accommodation Plan in place **do not** need to submit SDA form.
- For extenuating circumstances (e.g. prolonged illness, family matters, etc.) contact the instructor.

Brightspace will be used to post lectures, updates and announcements.

Late assignments: A 10% reduction in grade will be applied for every day an assignment is late.

Assignment submission: Assignments should be submitted via Brightspace as .pdf file by 11:30 pm on the due date.

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Course Content

Detailed Schedule

All dates and times are in **Halifax Time** (ADT/UTC-3 or AST/UTC-4). Note that quizzes, exams and other due dates are shown in red and synchronous (not required) events are shown in blue.

Week	Date	Content
Course introduction		
1	Thu, Jan 6 @ 4:05 pm	Zoom meeting (questions, discussion, chat). See link in Brightspace.
Module 1. Aquaculture background | History and production trends		
2	Tue, Jan 11 @ 4:05 pm	Zoom meeting (questions, discussion, chat). See link in Brightspace.
	Thu, Jan 13 @ 4:05 pm	Zoom meeting (questions, discussion, chat). See link in Brightspace.
	Thu, Jan 13 @ 11:30 pm	Quiz: Module 1 (don't forget to upload your cheat-sheet BEFORE quiz)
	Thu, Jan 13 by 11:30 pm	New content is uploaded. Make sure to review it before Tuesday's zoom, so you can ask questions before the quiz
Module 2. Physicochemistry of water | Physicochemistry of sediments		
3	Tue, Jan 18 @ 4:05 pm	Zoom meeting (questions, discussion, chat). See link in Brightspace.
	Thu, Jan 20 @ 4:05 pm	Zoom meeting (questions, discussion, chat). See link in Brightspace.
	Thu, Jan 20 @ 11:30 pm	Quiz: Module 2 (don't forget to upload your cheat-sheet BEFORE quiz)
	Thu, Jan 20 by 11:30 pm	New content is uploaded. Make sure to review it before Tuesday's zoom, so you can ask questions before the quiz
Module 3. Sources of water | Culture systems 1 and 2		
4	Tue, Jan 25 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Jan 27 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Jan 27 @ 11:30 pm	Quiz: Module 3 (don't forget to upload your cheat-sheet BEFORE quiz)
	Thu, Jan 27 by 11:30 pm	New content is uploaded. Make sure to review it before Tuesday's zoom, so you can ask questions before the quiz
Module 4. Microalgae (biofuels) and other live feed | Macroalgae | Bivalves and other mollusks		
5	Tue, Feb 1 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Feb 3 @ 4:05 pm	Midterm 1: Includes Modules 1, 2, 3, and 4 (don't forget to upload your cheat-sheet BEFORE quiz)
	Thu, Feb 3 by 11:30 pm	New content is uploaded. Make sure to review it before Tuesday's zoom, so you can ask questions before the quiz
Module 5. Shrimps and other crustaceans | Freshwater finfish (carp and tilapia)		
6	Tue, Feb 8 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Feb 10 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Feb 10 @ 11:30 pm	Quiz: Module 5 (don't forget to upload your cheat-sheet BEFORE quiz)
	Thu, Feb 10 by 11:30 pm	New content is uploaded. Make sure to review it before Tuesday's zoom, so you can ask questions before the quiz
Module 6. Salmonids | Marine finfish		
7	Tue, Feb 15 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Feb 17 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Feb 17 @ 11:30 pm	Quiz: Module 6 (don't forget to upload your cheat-sheet BEFORE quiz)
	Thu, Feb 17 by 11:30 pm	New content is uploaded. Make sure to review it before Tuesday's zoom, so you can ask questions before the quiz
8	Mon, Feb 21…	Reading week
	…Fri, Feb 25	Reading week

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Module 7. Aquaculture engineering 1 and 2		
9	Tue, Mar 1 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Mar 3 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Mar 3 @ 11:30 pm	Quiz: Module 7 (don't forget to upload your cheat-sheet BEFORE quiz)
	Thu, Mar 3 by 11:30 pm	New content is uploaded. Make sure to review it before Tuesday's zoom, so you can ask questions before the quiz
Module 8. Aquaculture modelling		
10	Tue, Mar 8 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Mar 10 @ 4:05 pm	Midterm 2: Includes Modules 5, 6, 7 and 8 (don't forget to upload your cheat-sheet BEFORE quiz)
	Thu, Mar 10 by 11:30 pm	New content is uploaded. Make sure to review it before Tuesday's zoom, so you can ask questions before the quiz
Module 9. Genetics and reproduction 1 and 2		
11	Tue, Mar 15 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Mar 17 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Mar 17 @ 11:30 pm	Quiz: Module 9 (don't forget to upload your cheat-sheet BEFORE quiz)
	Thu, Mar 17 by 11:30 pm	New content is uploaded. Make sure to review it before Tuesday's zoom, so you can ask questions before the quiz
Module 10. Diseases		
12	Tue, Mar 22 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Mar 24 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Mar 24 @ 11:30 pm	Quiz: Module 10 (don't forget to upload your cheat-sheet BEFORE quiz)
	Thu, Mar 24 by 11:30 pm	New content is uploaded. Make sure to review it before Tuesday's zoom, so you can ask questions before the quiz
Module 11. Sustainability and controversies		
13	Tue, Mar 29 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Mar 31 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
	Thu, Mar 31 @ 11:30 pm	Quiz: Module 11 (don't forget to upload your cheat-sheet BEFORE quiz)
	Thu, Mar 31 by 11:30 pm	**Please do your SRI (Student Rating of Instruction)**
14	Tue, Apr 5 @ 4:05 pm	Zoom or classroom meeting (questions, discussion). See link in Brightspace.
15	Scheduled by Registrars Office	Final exam: Includes all course content

NOTE: Dates and topics may change depending on course pace and weather-related class cancellations.

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

University Grading Practices

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

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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/academic-advising.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/services-support/student-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