

**Faculty of Science Course Syllabus (Section A)****Department of Oceanography****OCEA5330/Credit Hours: 3/Benthic Ecology****Winter 2025****Class hours: 3, Classroom Location - Studley LSC-COMMON AREA C202**

*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.*

**Instructor:** Craig J. Brown**Lectures:** Monday/Wednesday/Friday 1135-1225**Office:** Room 4634, Life Sciences Centre, 1355 Oxford Street,**Office Phone:** +1-902-494-7177**Office Hours:** By appointment (to be set up by email)**Email:** [craig.brown@dal.ca](mailto:craig.brown@dal.ca)**Course delivery:** In-person

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**Course Description**

A graduate course on major topics of benthic ecology, such as animal-sediment relationships, ecosystem processes and geospatial patterns of structure and dynamics of benthic communities. Courses consist of two lectures per week and one journal discussion session. The last three weeks are devoted to a class research project.

**Course Pre-requisites, Co-requisites and/or other Restrictions**

Permission of instructor

**Learning Objectives**

Upon completion of this course, students should be able to:

*Learning Outcome #1*

Describe and explain how benthic ecosystems are structured from both abiotic and biotic perspectives, including geospatial complexities, with particular reference to different substrates and associated seafloor assemblages.

*Learning Outcome #2*

Define and recognize how benthic ecosystems function, the role that biodiversity plays in ecosystem functioning, and how benthic organisms adapt to, respond to and/or regulate their environment.

Learning Outcome #3

Describe and compare the sampling and survey methods that are used to study benthic habitats, in order to be able to design robust experimental approaches suited for a particular benthic habitat type.

Learning Outcome #4

Describe and evaluate various forms of anthropogenic impacts and stressors on benthic ecosystems, and the methods and management strategies used to mitigate these impacts.

Learning Outcome #5

Analyse and interpret biological and environmental data from marine benthic habitats using descriptive, univariate and multivariate statistical methods over various temporal and spatial scales.

**Course Materials**

A selection of peer-reviewed papers will be used as reading material, with weekly discussion sessions on the assigned papers. Additional reading material will also be assigned associated with the lecture material. All required course material will be made available through Brightspace.

**Course Assessment**

Grades will be based on five requirements, and a grading rubric for each assessment will be made available through Brightspace:

Assessment	Date of evaluation	Weight
Critique of a published research paper	Due 1 week after chosen paper discussion	15%
Thematic term paper on a selected subject area in benthic ecology	End of week 8 (9 <sup>th</sup> March 2025)	35%
Class research project	2 <sup>nd</sup> and 4 <sup>th</sup> April 2025	25%
Participation in the weekly discussions	Weekly – weeks 2-8	5%
Class Test	Week 9 (12 <sup>th</sup> March 2025)	20%

Grades will be assigned as below using the Dalhousie Common Grade Scale:

A+ (90-100)	B+ (77-79)	F (<50)
A (85-89)	B (73-76)	
A- (80-84)	B- (70-72)	

**Critique**

Graduate students in the class will critique **two** of the journal articles from the weekly discussions. I will provide critique guidelines which are designed to help guide the process of critiquing research papers. This exercise will familiarize students with the process of scientific investigation and peer-review while examining an example of a benthic ecology study published in the literature. You will write up the critique (no longer than 5 pages double spaced) following the guidelines. You may critique any of the set discussion papers, with the written critique due 1 week following the discussion session for the chosen paper.

**Thematic term paper**

Your term paper will allow you to dive deeper into the scientific literature on an issue of greatest interest to you. You will be provided with detailed instructions on what is required at the start of term. You may choose to write your paper on a topic that relates to benthic ecology. I will approve the topic of your paper

once you have selected it, along with an outline of your paper by the end of week 3 (Title, subheadings providing structure to your paper, bullet points under each section outlining content, and listing key references for the paper). Your completed term paper will be due end of week 8 (12-15 pages, double spaced excluding reference list).

### **Class research project**

A class research project will be undertaken in the last 3 weeks of term to characterize environmental properties of a benthic ecosystem and quantify the correspondence of benthic community structure to these features. The project will involve the collection of benthic community data from a subtidal ecosystem based on a subsea photographic data set. Experimental survey design and data extraction methods will be an integral part of the study. Benthic species will be identified and counted from the photographs at different environments and compiled into a class data set. Individually, you will then undertake appropriate statistical analyses, and spatially compare the biological community patterns against different environmental measurements. You will present the finding from this research in small groups to the rest of the class on the 2<sup>nd</sup>, 4<sup>th</sup> and 7<sup>th</sup> April. Classes in the last 3 weeks of semester will be devoted to the data extraction and analyses, with interactive hands-on classes. Detailed instructions on all elements of the project will be provided.

### **Weekly discussions**

You will be assessed based on your participation in the weekly discussion on the assigned papers. The class will be broken into small groups, and each week a different student within each group will lead the discussion. Your participation will be evaluated based on how prepared you are for the discussion, and your engagement and contribution to the group.

### **Class Test**

You will be tested on your comprehension of the lecture material in week 9 through a short, written test (multiple choice and short answer).

## **Course Policies on Missed or Late Academic Requirements**

### **Missed or Late Academic Requirements due to Student Absence**

Dalhousie students are asked to take responsibility for their own short-term absences (5 days or less) by contacting their instructor by phone or email **prior to** the academic requirement deadline or scheduled time and by submitting a completed Student Declaration of Absence (SDA) to their instructor in case of missed or late academic requirements. The SDA form can be found on our Brightspace page under "Assignments". Only **TWO** separate Student Declaration of Absence forms may be submitted per term for this course. Once the SDA has been submitted, alternate arrangements for the missed or late assignment will be at the discretion of the instructor.

Assignments submitted late without prior notification and the submission of an SDA, or without an approved extension will be deducted 10% per day. Extensions are granted with good reason and **must be requested at least one week prior** to the assignment's original due date.

If you are ill for the class test you must contact the instructor by email and submit an SDA. A make up test will be scheduled for the week following the originally scheduled test.

**Course Schedule. All classes are in-person. \*Friday 7th Feb – Munroe Day. No discussion paper that week.**

<b>Week (dates)</b>	<b>Lesson</b>	<b>Topics</b>	<b>Activity</b>
1 (6-10 Jan)	<b>Learning Objective #1 – Benthic systems</b>		
	1	Introduction – Course overview	Lecture
	2	Recap: general concepts/ definitions	Lecture
2 (13-17 Jan)	3	Sedimentary processes	Lecture
	4	Intertidal benthic environments	Lecture
	5	Shelf environments	Lecture
3 (20-24 Jan)	6	Paper critiques - introduction	Discussion
	7	Deep sea environments	Lecture
	<b>Learning Objective #2 – Benthic ecosystem structures and functions</b>		
4 (27-31 Jan)	8	Life cycles	Lecture
	9	Paper Discussion #1	Discussion
	10	Benthic community composition	Lecture
5 (3-7 Feb)	11	Benthic-pelagic coupling	Lecture
	12	Paper Discussion #2	Discussion
	13	Animal-sediment relationships	Lecture
6 (10-14 Feb)	14	Benthic biodiversity	Lecture
	MUNRO DAY – NO CLASS		
	<b>Learning Objective #3 – Tools and approaches for studying the benthos</b>		
17-21 February - Winter study week	15	Benthic sampling and experimental approaches	Lecture
	16	Benthic habitat mapping 1	Lecture
	17	Paper Discussion #3	Discussion
7 (24-28 Feb)	18	Benthic habitat mapping 2	Lecture
	<b>Learning Objective #4 – Benthic impacts</b>		
	19	Climate change	Lecture
8 (3-7 Mar)	20	Paper Discussion #4	Discussion
	21	Pollution impacts	Lecture
	22	Fisheries and aquaculture	Lecture
9 (10-14 Mar)	23	Paper Discussion #5	Discussion
	24	Conservation of benthic ecosystems	Lecture
	25	Class Test	Test
10 (17-21 Mar)	<b>Learning Objective #5 – Collection, analysis, and interpretation of benthic data</b>		
	26	Class Project – Introduction to data sets	Lecture
	27	Class Project – Data extraction	Lecture
11 (24-28 Mar)	28	Class Project - Independent working	No class
	29	Class Project - Independent working	No class
	30	Class Project – Data analysis	Lecture
12 (31 Mar -4 Apr)	31	Class Project - Independent working	No class
	32	Class Project - Data presentation	Lecture
	33	Class Project - Independent working	No class
7 Apr	34	Class Project - Presentations	Presentations
	35	Class Project - Presentations	Presentations
	36	Class Project – Presentations (if class time required)	Presentations

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

The use of Large Language Models (LLMs) such as ChatGPT are not permitted in producing the written assignments for this course. Assignments are designed to develop students' own knowledge and understanding on the topics covered during the course, and to share their own personal views on the topics covered, rather than falling back on the generic voice of artificial intelligence. If use of LLMs is suspected following grading of submitted work, a follow up oral discussion on the topic of the assignment will be scheduled with the course instructor. If the use of LLMs is suspected following this oral discussion with the student, the matter will be referred to the Academic Integrity Officer.

## **SECTION B: University Policies and Statements**

**This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate**

### **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 the Indigenous Student Centre can be found at: [https://www.dal.ca/campus\\_life/communities/indigenous.html](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](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/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](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](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.

## SECTION C: Student Resources and Support

### University Policies and Programs

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

[http://www.dal.ca/academics/important\\_dates.html](http://www.dal.ca/academics/important_dates.html)

Classroom Recording Protocol:

[https://www.dal.ca/dept/university\\_secretariat/policies/academic/classroom-recording-protocol.html](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](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](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](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](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](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](https://www.dal.ca/campus_life/academic-support/On-track.html)

Indigenous Student Centre: [https://www.dal.ca/campus\\_life/communities/indigenous.html](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](mailto: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](https://www.dal.ca/campus_life/communities/black-student-advising.html)

International Centre: [https://www.dal.ca/campus\\_life/international-centre.html](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](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](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](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>