

Faculty of Science Course Syllabus (Section A)**Department of Oceanography*****OCEA4330/Credit Hours: 3/Benthic Ecology******Winter 2023******Class hours: 3, Classroom Location: Studley MCCAIN ARTS&SS 2176******Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.******We acknowledge the histories, contributions, and legacies of the African Nova Scotian people and communities 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**Course delivery:** In-person**Course Description**

A fourth-year undergraduate 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

OCEA 2001.03, OCEA 2002.03, BIOL 2060.03, or 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 (10 th March 2023)	35%
Written report on the class research project	14 April 2023	25%
Participation in the weekly discussions	Weekly – weeks 1-8	5%
Class Test	Week 9 (17 March 2023)	20%

Grades will be assigned as below using 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)	

Critique

Undergraduate students in the class will critique one 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 (by end of week 3). You will then provide me with an outline of your paper by the end of week 5 (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 (8-10 pages, double spaced excluding reference list).

Written report on the 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 write up the project as a report in the style of a short scientific paper, due on the 14th April. One lecture period each week will be devoted to a workshop on data analysis in R. 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 at the end of 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 (3 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 3rd Feb – Munroe Day. No discussion paper that week.

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

NO CLASS – Good Friday Holiday			
10 Apr	35	Class Project - Independent working	Write up
11 Apr	36	Class Project - Independent working	Write up

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

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://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=117&chapterid=-1&topicgroupid=31821&loaduserredits=False>

University Grading Practices

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

SECTION C: 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/undergrad-students/degree-planning.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.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>