

**Faculty of Science Course Syllabus  
Department of Oceanography  
OCEA 4380/5380  
Marine Modelling  
Winter 2020**

**Professor:** Dr. Katja Fennel [katja.fennel@dal.ca](mailto:katja.fennel@dal.ca) LSC-O 2635  
Office hours: Mondays @ 2:30 – 3:30 pm (e-mail for appointment)

**Teaching Assistant (TA):**

Benjamin Richaud [benjamin.richaud@dal.ca](mailto:benjamin.richaud@dal.ca) LSC-O 2621

**Lectures:** Tuesdays and Thursdays 4:35 – 5:25 pm LSC-O 3652 (Riley Room)

**Laboratories:** Mondays 3:35am – 4:25 pm Kenneth Rowe Mgmt 3080

**Course Description**

This course is designed to introduce a variety of modeling techniques useful in oceanography and the natural sciences in general. The main objective is to provide an overview of a range of techniques, rather than exhaustive and in-depth discussion of any particular technique. The approach is to introduce techniques, discuss their assumptions and limitations, and apply them to simple problems in oceanography and earth sciences. This is accomplished by a combination of lectures and labs. At the end of this course, students should have an understanding of various modeling approaches and their applicability; as a result, they will be better placed to both carry out their own research, and to critically evaluate the literature. A series of more or less independent modules will be presented, each of which will include an introduction to a particular technique, some examples, and an assignment in which the student will have the opportunity to apply the techniques to simple problems.

**Course Prerequisites for OCEA 4380**

MATH 1000, MATH 1010, OCEA 2020, OCEA 2021, or permission of instructor

**Course Objectives/Learning Outcomes**

After completing this course, you should have a

- Basic understanding of various modeling approaches
- Working knowledge of MatLab
- Ability to decide which modeling techniques are appropriate for specific research problems you encounter (for graduate students only)

**Course Materials**

Lecture materials will be posted on <http://memg.ocean.dal.ca/fennel/MM2020> (login: MMstudent, password: oceans20). The Blackboard Learning System will be used for dissemination of assessments and grades.

Access to MatLab on your own computers will be essential for completing homework and your class project. Dalhousie has a site license that includes student-owned computers (see

[http://www.dal.ca/news/today/2015/07/22/software\\_license\\_for\\_matlab\\_now\\_available\\_for\\_students.html](http://www.dal.ca/news/today/2015/07/22/software_license_for_matlab_now_available_for_students.html))

Download and follow installation instruction here: <http://software.dal.ca>. Note: you will have to authenticate to this page with your NetID and password.

Recommended textbook: Modeling Methods for Marine Science, D.M. Glover, W.J. Jenkins & S.C. Doney, Cambridge University Press, 2011

### **Course Assessment**

Two homework assignments (each 15%; due on Feb 10 and March 26): Submission by e-mail is required with a hard copy to follow no later than the next day. All files used for calculations (e.g. MatLab scripts) are to be included so that your procedures can be checked, but your answers in each assignment must be complete on their own. You may discuss with others during the preparation of your assignment, but the work must be yours.

Two quizzes (20%; on Feb 11 and March 17): Quizzes will cover material from the preceding lectures only.

A term project (40%; due April 6): The project will be presented orally and in written form and will include a critical analysis of one or two modeling techniques from the literature. All students must present one modelling technique. Graduate students must present two techniques.

Class participation (10%): You are expected to attend classes and labs. Questions are encouraged and in fact expected. For your benefit, and that of your classmates, please interrupt when you have comments to offer or do not understand any part of the presentation.

Expectations will differ between graduate and undergraduate students on homework assignments and quizzes as follows. All assignments will have two parts. The first part must be completed by all students. The second part must be completed by the graduate students only, but undergraduate students are encouraged to attempt the second part for extra credit.

### **Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale**

<b>A+</b> (90-100)	<b>B+</b> (77-79)	<b>C+</b> (65-69)	<b>D</b> (50-54)
<b>A</b> (85-89)	<b>B</b> (73-76)	<b>C</b> (60-64)	<b>F</b> (<50)
<b>A-</b> (80-84)	<b>B-</b> (70-72)	<b>C-</b> (55-59)	

### **Course Policies**

Deadlines are specified for all assignments. Late submissions will not be accepted, except in the event of an illness, which is to be declared using the [Student Declaration of Absence Form](#).

If a lecture has to be cancelled for reasons other than campus closure, students will be informed by e-mail no later than 2 pm on the day of the lecture.

### **Course Content**

Lecture topics include:

- Measurement Theory and Errors
- Dimensional Analysis
- Probability
- Error Analysis
- Linear Algebra Refresher
- Population Dynamics
- Discriminant Analysis, Principal Component Analysis, EOF Analysis
- Least Squares Regression



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- Numerical Techniques

## 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](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](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](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](mailto:elders@dal.ca)).

**Information:** [https://www.dal.ca/campus\\_life/communities/indigenous.html](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](https://www.dal.ca/academics/important_dates.html)

**University Grading Practices**

[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)

**Missed or Late Academic Requirements due to Student Absence (policy)**

[https://www.dal.ca/dept/university\\_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html](https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html)

## Student Resources and Support

### Advising

**General Advising** [https://www.dal.ca/campus\\_life/academic-support/advising.html](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](https://www.dal.ca/campus_life/communities/indigenous.html)

**Black Students 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/current-students.html](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](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](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](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](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>