

# Atmospheric Dynamics I Syllabus

## Department of Physics & Atmospheric Science

### PHYC/OCEA 4411/5411 Fall 2023

*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.*

### Course Instructor(s)

Name	Email	Office Hours
Manuel Helbig	manuel.helbig@dal.ca	Scheduled via email

### Course Description

The basic laws of fluid dynamics are applied to studies of atmospheric motion, including the atmospheric boundary layer and synoptic scale weather disturbances (the familiar highs and lows on weather maps). Emphasis will be placed on the blend of mathematical theory and physical reasoning which leads to the best understanding of the dominant physical mechanisms.

#### *Course Prerequisites*

PHYC 2140.03 or permission of instructor

Ability to integrate simple differential equations and basic understanding of vector calculus

#### *Course Exclusions*

None

### Student Resources

Office hours (room 131, Dunn Building): Wed 2pm – 3pm

## Course Structure

### *Course Delivery*

In-person lectures (lectures can be recorded upon individual request)

### *Lectures*

Tue, Thu from 14:35 h to 15:55 h in Sir James Dunn Building 135 starting Sept 5, 2023

### *Laboratories*

None

### *Tutorials*

None

## Course Materials

- Lecture slides (posted on the Brightspace course website)
- Textbook (not mandatory)
  - o J.E. Martin: Mid-Latitude Atmospheric Dynamics: A First Course. ISBN: 978-0-470-86465-4.

## Assessment

### *Assignments*

<i>Assessment</i>	<i>Weight (% of final grade)</i>	<i>Dates</i>
Assignments	4 x 10%	Sep 21, Oct 12, Nov 14, Nov 21
Mid-term	25%	Oct 31
Test	25%	Nov 28
Participation	5%	-

### *Participation*

Students are strongly encouraged to ask questions and participate in class discussions. A student's level of engagement throughout the term will be reflected in their participation grade, comprising a maximum of 5 points toward their final mark.

Conversion of numerical grades to final letter grades follows the

#### Dalhousie Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

## Course Policies on Missed or Late Academic Requirements

Students do not need to use the Absence Form.

Late Assignments will lose 10% of value per day.

All assignments and test must be completed. If students must miss a requirement, they will be offered a make-up exam or alternate assignment.

## Course Policies related to Academic Integrity

Students are welcome to discuss assignments but are not permitted to share written material. No collaboration is accepted for test.

Where possible, plagiarism software will be used to identify cases of copying work from uncited sources.

Generative AI and large language models (e.g., ChatGPT) cannot be used for assignments.

## Learning Objectives

After completing the course, students are expected to:

- have a basic understanding of tropospheric dynamics,
- be able to understand weather map features (highs, lows, isobars),
- be able to interpret weather analysis charts.

## Course Content

Part I of the course deals mostly with establishing basic principles and deriving the governing equations of motion in the atmosphere, whereas Part II focuses on applications, including weather.

### *Lecture topics*

Review of mathematical tools

Fundamental and apparent forces explaining the behavior of the fluid atmosphere

Mass, momentum, and energy equations

Applications of the equations of motion

## 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](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/dept/university\\_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html](https://www.dal.ca/dept/university_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.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.