

**Faculty of Science Course Syllabus  
Departments of Physics and Atmospheric Science**

PHYC/OCEA 4505/5505

Atmospheric Physics

Winter 2023

*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:** Prof. Rachel Chang [rachel.chang@dal.ca](mailto:rachel.chang@dal.ca)

Dunn 129

Expect up to one business day for replies

**Lectures:** MWF 1:35-2:25 PM in Dunn 302

**Office Hours:** by appointment

**Website:** Brightspace (<https://dal.brightspace.com/d2l/login>)

### **Course Description**

Moist thermodynamics is applied to a variety of atmospheric phenomenon. These include aerosols, cloud droplets, precipitation formation, convection, supercells, hurricanes, lightning, and the boundary layer. We also discuss the radar equation and the interpretation of radar images.

### **Course Prerequisites**

PHYC4520, or permission of the instructor

### **Learning Objectives**

- Conceptual understanding of warm rain processes
- Mathematically calculate evaporation of falling rain
- Calculate mixing of moist air parcels
- Factors determining hurricane formation
- Understand cloud droplet nucleation
- Understand origin of boundary layer turbulence
- Understand factors which affect convective inabillity
- Understand origin of lightning

### **Course Materials**

Atmospheric Science, An Introductory Survey, Wallace and Hobbs

### **Supplementary Course Materials**

Practical Meteorology, Roland Stull ([https://www.eoas.ubc.ca/books/Practical\\_Meteorology/](https://www.eoas.ubc.ca/books/Practical_Meteorology/))

A Short Course in Cloud Physics, Rogers and Yau

An Introduction to Clouds: From the microscale to climate, by Lohmann, Lüönd, and Mahrt

Microphysics of Clouds and Precipitation, Pruppacher and Klett

### Course Delivery

Lectures will be delivered in person. The instructor will do their best to record each lecture and make the recording available. However, this is contingent on the technology working and is not guaranteed. It is expected that students will write quizzes and the final exam on-campus or in another proctored environment. Students connecting to online resources from outside Canada are responsible for ensuring awareness and compliance with any applicable laws in the country from which they are connecting.

### Course Assessment

Assessment	Weight (% of final grade)	Date
<i>Assignments</i>	15%	Approximately weekly
<i>Quizzes</i>	30%	Jan 30, Mar 3, Mar 27 (subject to change)
<i>Project</i>	10%	April 3, 2023
<i>Final exam</i>	40%	Final exam period
<i>Participation</i>	5%	

### Conversion of numerical grades to Final Letter Grades follows 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)		

### Project

Students are to write a 1500-word literature review on a topic related to the learning objectives. The report should survey the primary literature and include motivation for the topic, our current understanding of the topic, uncertainties in our understanding, as well as future research directions. A short document with a one paragraph outline of the proposed topic and three references is due by February 17, 2023. A marking rubric will be posted on the class website.

### Course Policies on Missed or Late Academic Requirements

- Assignments will be due in class. 10% will be deducted for each day they are late. The assignment with the lowest grades will be discarded when computing the average grades.
- Missed quizzes will be dropped. The quiz grade will be determined from the remainder. At least one quiz is required to pass the course.
- A missed final exam will be made up.
- The Dalhousie regulation of self-declaration of absence is welcome in lieu of sick notes.
- There is no way to make up uncompleted course requirements or employ alternate evaluation schemes.

### Course Policies related to Academic Integrity

Assessments are intended to be individual efforts. You can discuss the problem with fellow students, but collaboration between students in the writing of solutions is not allowed. You must write the solutions alone.

### University Resources posted on course website

**Course Content**

- Aerosol, cloud, and precipitation physics and moist thermodynamics
- Convection, lightning, and hurricanes
- Boundary layer and surface fluxes

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

### 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)