

Faculty of Science Course Syllabus**Departments of Physics and Atmospheric Science, Chemistry, and Oceanography**

PHYC/CHEM/OCEAN 4595/5595

Atmospheric Chemistry

Fall 2022

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(s): Prof. Rachel Chang 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: to be determined

Course Description

A fundamental introduction to the physical and chemical processes determining the composition of the atmosphere and its implications for climate, ecosystems, and human welfare. Origin of the atmosphere. Nitrogen, oxygen, carbon, sulfur cycles. Climate and the greenhouse effect. Atmospheric transport and turbulence. Stratospheric ozone. Oxidizing power of the atmosphere. Regional air pollution: aerosols, smog, acid rain.

Course Prerequisites

MATH 1000, PHYC 1190/1290 or PHYC 1300, and CHEM 1011/1012 or equivalent

Learning Objectives

Develop critical-thinking skills

Identify dominant processes affecting atmospheric composition

Integrate knowledge of atmospheric chemistry to formulate simple models

For 5595, apply knowledge of atmospheric chemistry to scientific writing and public speaking

Course Materials

Introduction to Atmospheric Chemistry, by D.J. Jacob, 1999 (available online)

Errata: <http://acmg.seas.harvard.edu/people/faculty/djj/book/errata.print.html>

Supplemental Problems:

http://acmg.seas.harvard.edu/education/eps133/Jacob_atmchem_problems_aug_2014.pdf

Other useful texts:

- Chemistry of the Upper and Lower Atmosphere, by B.J. Finlayson-Pitts & J.N. Pitts, 2000
- Atmospheric Chemistry and Physics, by J.H. Seinfeld and S.N. Pandis, 2016
- Modeling of Atmospheric Chemistry, by G.P. Brasseur and D.J. Jacob, 2017
- Atmospheric Chemistry and Physics, by J.H. Seinfeld and S.N. Pandis, 2016

- Introduction to Atmospheric Chemistry, by Peter Hobbs, 2006
- Chemistry of Atmospheres, by R.P. Wayne, 2000
- Chemistry of the Natural Atmosphere, by P. Warneck, 2000

Course Delivery:

Lectures will be delivered in person. The instructor will do their best to stream and record each lecture via Teams. 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>	4595 (15%), 5595 (10%)	Throughout
<i>Problem Sets</i>	4595 (10%), 5595 (10%)	Throughout
<i>Quizzes</i>	4595 (35%), 5595 (30%)	TBD – mid-October & early November
<i>Final exam</i>	4595 (35%), 5595 (30%)	Posted Oct 1 by Registrar's Office
<i>Participation</i>	5%	
<i>Graduate Project</i>	5595 (15%)	Dec 7

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)		

Assignments – will be given approximately weekly, weighted equally, and marked for completeness.

Problem sets – will be computationally based and marked for correctness.

Course Policies on Missed or Late Academic Requirements

- Assignments and problem sets will be due in class. 20% will be deducted for each day they are late. The assignment and problem set 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 remaining one. 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.
- Graduate students will be expected to answer extra problems on assignments, quizzes, and exams. Graduate number to letter conversion: A+(90-100), A(85-89), A-(80-84), B+(77-79), B(73-76), B-(70-72), F(below 70)

Course Policies related to Academic Integrity

- Assignments 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**

Chapter 1 – Measures of atmospheric composition

Chapter 2 – Structure of the atmosphere

Chapter 3 – Simple models

Chapter 4 – Atmospheric transport

Chapter 6 – Geochemical cycles

Chapter 7 – Greenhouse effect

Chapter 8 – Aerosols

Chapter 9 – Chemical kinetics

Chapter 10 – Stratospheric chemistry

Chapter 11 – Tropospheric chemistry

Chapter 12 – Ozone and smog chemistry

Chapter 13 – Acid rain

Other topics as time permits – air quality instruments, SARS-CoV2, indoor air quality

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&loadusercredits=False>

University Grading Practices

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