

# Aerosol Physics, Chemistry, Clouds & Climate

## ATS772

Spring 2022

Mondays and Wednesdays @ 11:00 – 12:15 in 121 ATS West

Instructor: Jeff Pierce <jeffrey.pierce@colostate.edu>, Atmos 220  
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TA: Sam O'Donnell <samuel.odonnell@colostate.edu>, Atmos 221

Office hours: **Sam: TBD; Jeff: TBD (Email either for appointments for other times)**

Slack channel: [slack-gtc9395.slack.com](https://slack-gtc9395.slack.com)

Zoom: When fully healthy, I expect in-class attendance to help facilitate in-class discussions. However, if you are sick, please join using the following zoom link  
(<https://zoom.us/j/97236044244?pwd=ZzZIMldlRjNHQlVHU3RmbzFIQitQT09>). Further, I will record all lectures and these will be accessible from the Canvas website.

Prerequisites: (CHEM 114 and MATH 161) and (PH 122 or PH 142) or permission from instructor.

Class Website: CSU Canvas (<http://info.canvas.colostate.edu/login.aspx>)

Recommended textbooks:

“Atmospheric Chemistry and Physics” by Seinfeld and Pandis, 2<sup>nd</sup> ed.

“A Short Course in Cloud Physics” by Rogers and Yau, 3<sup>rd</sup> ed.

Additional text: “Microphysics of Clouds and Precipitation” by Prupacher and Klett

Objectives: (1) Become well-versed with the major concepts of physics and chemistry of atmospheric aerosols including composition, size, and interaction with radiation and clouds. (2) Develop research-grade models of aerosols, clouds, and radiation that synthesize the above concepts.

Grading: Participation ..... 10%  
Homework (~6-7) ..... 50% total  
Project ..... 40%

Homework: There will be an assignment every 1-2 weeks (about 7-8 assignments total). The homework is designed to guide you on your project. The homework and project should be synergistic.

Midterm/Final: There will be no exams in this class.

**Project:** The project is designed to incorporate much of the aerosol (and aerosol-cloud interactions) phenomena we discuss in class. Students may work individually or in teams, but teams are expected to have a more extensive project. I have a separate hand out to guide you on project topics.

In the last day of class, the individuals/teams will present their project in a Power Point type presentation describing the results and interesting things that you found.

**Grading (grads):**

A .....	90-100%
B .....	80-89.9%
C .....	70-79.9%
F .....	< 70%

Potential topics (I will not be able to cover all of these in the detail that I would like. If you have preferences, please let me know early in the semester):

1. Overview of aerosols
2. Particle/droplet size distributions
3. Single-particle/droplet dynamics
4. Microphysics
  1. Condensation
  2. Coagulation
  3. Aerosol nucleation
  4. Solution of the General Dynamic Equation
  5. Cloud Condensation Nuclei and cloud-droplet activation
  6. Cloud ice
5. Aerosol thermodynamics/chemistry
  1. Inorganic aerosol
  2. Aerosol water uptake
  3. Organic aerosol
6. Optics (for both aerosols and clouds)
  1. Aerosol direct effect
  2. Aerosol indirect effect
  3. Remote sensing instrumentation
7. Aerosol dry deposition

**Important information for students:**

**Masks are required inside university buildings. You must also meet university vaccine or exemption requirements.**

**All students are expected and required to report to the COVID Reporter (<https://covid.colostate.edu/reporter/>) when:**

- You suspect you have symptoms of COVID, regardless of whether or not you are vaccinated and even if your symptoms are mild
- You have tested positive for COVID through a non-CSU testing site, such as home test or test at a pharmacy
- You believe you may have been exposed to COVID go to the COVID Reporter and follow the guidance under “I believe I have been in close contact with someone who has COVID-19.” This guidance will depend upon your individual circumstances

You will not be penalized in any way for reporting symptoms or concerns.

**Do not ask me as your instructor to report for you. It is your responsibility to report through the COVID Reporter promptly.**

**As your instructor I may not ask you about vaccination status or if you have COVID but you may freely volunteer to send me information from a public health official - if you have been asked to isolate or quarantine.**

When you complete the COVID Reporter, the CSU Public Health office is notified. Once notified, that office will contact you and, depending upon each situation, will conduct contact tracing, initiate any necessary public health requirements and notify you if you need to take any steps.

If you do not have internet access to fill out the online COVID-19 Reporter, please call (970) 491-4600.

For the latest information about the University’s COVID resources and information, including FAQs about the spring semester, please visit the **CSU COVID-19 site** <https://covid.colostate.edu/>.

## CLASS POLICIES

UNIVERSITY POLICIES: Students are expected to follow the CSU Student Honor Pledge ( <http://tilt.colostate.edu/integrity/honorpledge/>). This course will adhere to the CSU Academic Integrity Policy as found in the General Catalog (<http://www.catalog.colostate.edu/FrontPDF/1.6POLICIES1112f.pdf>) and the Student Conduct Code (<http://www.conflictresolution.colostate.edu/conduct-code>). At a minimum, violations will result in a grading penalty in this course and a report to the Office of Conflict Resolution and Student Conduct Services.

POLICY ON COLLABORATION: Students are encouraged to discuss homework assignments. However, each student must complete their own assignment. If I determine that students are simply copying assignments, I will pursue action through the Office of Academic Integrity (<http://tilt.colostate.edu/integrity/>). Any copying on tests will be similarly not tolerated.

POLICY ON LATE HOMEWORK ASSIGNMENTS: Late homework assignments will not be accepted, but I will drop the assignment with the lowest score.

POLICY ON REMARKING HOMEWORK: Students who disagree with how their assignment, test, or project has been marked should resubmit their work with a written explanation of their concern. The work will be re-evaluated by the instructor in its entirety.