**Course name:** Radar Meteorology

**Course number:** AT741

**Instructor:** Prof. Michael Bell, mmbell@rams.colostate.edu, 205 ATS

**TA information:** Alex DesRosiers, adesros@rams.colostate.edu, 215 ATS

**Office hours:** 2:00 pm - 3:00 pm Wednesdays, or by appointment

**Classroom and meeting time:** ACRC 212B, 11:00 AM – 12:15 PM, Monday and Wednesday

**Prerequisites:** AT652, or permission of instructor

**Class Website:** https://colostate.instructure.com/courses/180039

**Slack channel:** CSU Tropical workspace #ats741_s24 (by invitation)

**Course goals and Objectives:** AT741 is designed to provide a foundational understanding of radar meteorology. Topics presented include microwave scattering theory, Doppler principles, polarimetric radar, hydrometeor identification, rainfall estimation and radar platforms. The objective of the course is to provide the student with a working knowledge of radar meteorology including applications to remote sensing of clouds and precipitation.

**Textbook:** None. Digital course materials will be provided

**Course calendar:** Follows CSU course calendar

**Expectations:** Regular attendance is strongly recommended. Read the class notes in advance of class.

**Exam schedule:** There are no examinations. Course grading is based on homework assignments and a final research project.

**Course grading:** The course grade will be based on homework exercises (including some computer-based exercises) and a final research presentation due at the end of the semester.

**Suggested references:**

- Atlas (1990), *Radar in Meteorology*, AMS (Battan Memorial volume)
- Battan (1973), *Radar Observation of the Atmosphere*

- Bringi and Chandrasekar (2001), *Polarimetric Doppler Weather Radar*, Cambridge Press
- Doviak and Zrnic (1993), *Doppler Radar and Weather Observations*, Academic Press
- Rauber and Nesbitt (2018), *Radar Meteorology*, Wiley Blackwell
- Chandrasekar, Beauchamp, and Bechini (2023), *Introduction to Dual Polarization Weather Radar,* Cambridge Press

**Course content:**

### SECTION 1 – *Basics and Scattering*

Course introduction, history and basic principles of radar meteorology. Electromagnetic waves. Principles of dielectrics. Ray wave propagation. Scattering by spherical hydrometeors. Scattering by non-spherical and melting hydrometeors.

### SECTION 2 – *Radar Basics and Data*

Basic antenna and scanning principles. The radar equation. System hardware. Signal processing considerations. Doppler radar basics. Scanning considerations.

### SECTION 3 – *Doppler Radar*

Doppler spectra. Doppler signatures. Single Doppler retrievals. Multiple Doppler retrievals.

### SECTION 4 – *Multiparameter Radar*

Polarimetric variables. Polarimetric retrievals in rain. Polarimetric retrievals in ice/mixed-phase. Data QC, hydrometeor ID, rainfall algorithms.

### SECTION 5 – *Current topics, including new advances in ship-based, airborne, and spaceborne radars*

Special considerations with mobile platforms. Current and future research directions in radar meteorology.

**Inclusion Statement**
CSU Atmospheric Science is a leading global institution, and as such, all members of our community regardless of race, ethnicity, culture, religion, sexual orientation, gender identity and expression, physical ability, age, socioeconomic status or nationality are welcome as equal contributors. We value and appreciate diversity, and we believe that diversity on our campus

strengthens our entire scientific community. It is my intent that students from all backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that the students bring to this class be viewed as a resource, strength, and benefit. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally, or for other students or student groups.

## Academic Integrity

All students are subject to the policies regarding academic integrity found in the 2023 – 2024 General Catalog, found at
http://catalog.colostate.edu/general-catalog/policies/,
and the student conduct code (http://resolutioncenter.colostate.edu/conduct-code).
Other information on academic integrity can be found at
https://resolutioncenter.colostate.edu/academic-integrity/. Examples of academic dishonesty can be found in these sources. 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. *Academic Integrity includes the honest use of AI/LLM tools.*

## Special Statement on COVID-19

All students are expected and required to report any COVID-19 symptoms to the university immediately, as well as exposures or positive tests (even home tests).

- If you suspect you have symptoms, or if you know you have been exposed to a positive person or have tested positive for COVID (even with a home test), you are required to fill out the COVID Reporter.
- If you know or believe you have been exposed, including living with someone known to be COVID positive, or are symptomatic, it is important for the health of yourself and others that you complete the online COVID Reporter. Do not ask your instructor to report for you.
- If you do not have internet access to fill out the online COVID-19 Reporter, please call (970) 491-4600.
- You may also report concerns in your academic or living spaces regarding COVID exposures through the COVID Reporter. You will not be penalized in any way for reporting.
- When you complete the COVID Reporter for any reason, the CSU Public Health Office is notified. Students who report symptoms or a positive antigen test through the COVID Reporter may be directed to get a PCR test through the CSU Health Network's medical services for students.

For the latest information about the university's COVID resources and information, please visit the CSU COVID-19 site.