Course name: Radar Meteorology

Course number: AT741

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

TA information: Ting-Yu Cha, tingyu@rams.colostate.edu, 208 ATS

Office hours: 1:00 pm - 2:00 pm Wednesdays, or by appointment

Classroom and meeting time: ATS West 121, 11:00 AM – 12:15 PM, Monday and Wednesday

Prerequisites: AT652, or permission of instructor

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.

Statement on academic dishonesty: 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.

Exam schedule: There are no examinations. Course grading is based on homework assignments and final projects.

Contact hours: Roughly 1.5 hours of effort are expected to complete readings and homework assignments outside of class for each hour of class time.

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

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.

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/.