

AT741 - Radar Meteorology

Spring 2020

Course Syllabus

Course name: Radar Meteorology

Course number: AT741

Instructors: Prof. Michael Bell, 205 ATS, 491-8345;
Prof. Steven Rutledge, 307 ATS, 491-8283.

Web page: <http://radarmet.atmos.colostate.edu/AT741/>

Office hours: TBD

Classroom and meeting time: ACRC 212B, 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, dual-wavelength radar, mm-wave radars with applications. The course also provides information on the theory of radar including engineering principles. 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

Course readings: As recommended during the semester, also see course web page.

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, projects, and in-class presentations.

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

TA information: Kyle Chudler ([Kyle.Chudler @ colostate.edu](mailto:Kyle.Chudler@colostate.edu)), 317 ATS. Office hours are TBD.

Course grading: The course grade will be based on homework exercises (including some computer-based exercises), in-class presentation/discussion of assigned papers and a final class project (including oral presentation).

Suggested references:

- Atlas (1990), *Radar in Meteorology*, AMS (Battan Memorial volume)
- Battan (1973), *Radar Observation of the Atmosphere*
- ^[L]_[SEP]Bringi and Chandrasekar (2001), *Polarimetric Doppler Weather Radar*, Cambridge Press
- Doviak and Zrníc (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.^[L]_[SEP]Principles of dielectrics.^[L]_[SEP] Ray wave propagation.^[L]_[SEP]Scattering by spherical hydrometeors.^[L]_[SEP]Scattering by non-spherical and melting hydrometeors.

SECTION 2 – (*Radar Basics and Data*)

Basic antenna and scanning principles. The radar equation. System hardware.^[L]_[SEP]Signal processing considerations. Doppler radar basics. Scanning considerations.

SECTION 3 – (*Doppler Radar*)

Doppler spectra.^[L]_[SEP]Doppler signatures.^[L]_[SEP]Single Doppler retrievals. Multiple Doppler retrievals. Airborne radar.

SECTION 4 – (*Multiparameter Radar*)

Polarimetric variables. Polarimetric retrievals in rain. ^[L]_{SEP} Polarimetric retrievals in ice/mixed-phase. ^[L]_{SEP} Data QC, hydrometeor ID, rainfall algorithms.

SECTION 5 – (*Spaceborne Radar Topics*)

SECTION 6 – (*Radar Detection of Lightning*)