Term Information

Effective Term	Autumn 2026

General Information

Course Bulletin Listing/Subject Area	Atmospheric Sciences
Fiscal Unit/Academic Org	Geography - D0733
College/Academic Group	Arts and Sciences
Level/Career	Graduate, Undergraduate
Course Number/Catalog	5450
Course Title	Introduction to Meteorological Radar Systems, Observations, and Techniques
Transcript Abbreviation	Radar Systems
Course Description	Radars remotely observe and monitor conditions in the atmosphere. This class will provide an overview of how radars are constructed, how they operate, the types of atmospheric phenomena they observe, radar characteristics and interpretation of radar data for various meteorological/atmospheric phenomena, and ways that radar data can be utilized operationally and for research purposes.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week, 12 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites	Prerequisites: GEOG 5940, ATMOSSC 5401, and MATH 1152
Exclusions	None
Electronically Enforced	Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	40.0401
Subsidy Level	Doctoral Course
Intended Rank	Junior, Senior, Masters, Doctoral

Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Explain how a radar works (generates, transmits, and receives electromagnetic energy).
- Describe how data are converted from a return signal to the pixel value seen on a data display.
- Interpret radar imagery from a variety of traditional and polarimetric radar-derived variables (e.g. reflectivity, radial velocity, spectrum width, ZDR, correlation coefficient).
- Identify and interpret specific atmospheric features and signatures observed from radar data (severe storms, atmospheric waves, winter weather features).
- Describe alternative atmospheric observation methods (e.g. dual-Doppler analysis, VAD, vertical profilers) that can be performed by radars (what they are, when they are used, limitations, etc).

Content Topic List

- Radar Hardware, Characteristics, and Paths
- Electromagnetic Fields, Waves and Propagation
- Doppler Velocity, Patterns, Spectrum, and Signal Processing
- Sever Storms Interpretation
- Radar Pattern Interpretation of Severe Storms
- Winter Weather and Midlatitude Cyclone Patterns
- Interpreting Tropical Cyclones and Waves
- Cloud Radars and Vertical Profilers

Sought Concurrence

No

Attachments

- AtmoSci 5450 Radar Cover Letter.pdf: ATMOSSC 5450_Cover Letter

  (Cover Letter. Owner: Godfrey,Ryan B)
- AtmoSci 5450 Syllabus Radar-OSU.pdf: ATMOSSC 5450_Syllabus

  (Syllabus. Owner: Godfrey,Ryan B)
- Curriculum Map_ATMOSSC BS_ATMOSSC 5450_ March2025.pdf: ATMOSSC 5450_Curriculum Map

  (Other Supporting Documentation. Owner: Godfrey,Ryan B)

Comments

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Godfrey,Ryan B	03/05/2025 01:47 PM	Submitted for Approval
Approved	Houser,Jana Bryn	03/05/2025 02:01 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	03/25/2025 12:33 PM	College Approval
Pending Approval	Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Neff,Jennifer Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	03/25/2025 12:33 PM	ASCCAO Approval

DEPARTMENT OF
GEOGRAPHY

THE OHIO STATE UNIVERSITY
COLLEGE OF ARTS AND SCIENCES

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2/26/2025

Subject: New Elective Course Proposal: AtmosSci 5450

Dear Arts and Sciences Curriculum Committee,

Please find the attached syllabus and submission for a new course in the Department of Geography: AtmosSci 5450: Introduction to Meteorological Radar Systems, Observations, and Techniques. This class is being proposed for addition to the Atmospheric Science B.S. degree for 3 credit hours of elective credits.

This course is being designed around the acquisition of a new mobile radar platform, which will arrive on campus during the winter of 2025-26. Data collected by the instrument will be used for the final project in the class.

I look forward to hearing your feedback about the course.

Sincerely,

Dr. Jana Houser
Associate Professor of Meteorology
Director of Undergraduate Studies
Department of Geography
The Ohio State University
houser.262@osu.edu

ATMOS SCI 5450
Syllabus: Introduction to Meteorological Radar Systems, Observations, and Techniques
Course # XXXX Credits: 3

Course Description: Radars are one of the primary instruments used to remotely observe and monitor conditions in the atmosphere, particularly precipitation. This class will provide an overview of how radars are constructed, how they operate, the types of atmospheric phenomena they observe, radar characteristics and interpretation of radar data for various meteorological/atmospheric phenomena, and ways that radar data can be utilized operationally and for research purposes outside of traditional data displays. It will further leverage the OSU Mobile, Phased array radar through relevant demonstrations and data collection activities.

Class Information: 3 credits
Mode of delivery: In person
Lectures: Mondays and Wednesdays 12:45-2:05 (Derby 070)
Prerequisites: Geog 5940, Atmos Sci 5401, Math 1152

Instructor: Dr. Jana Houser
Email: houser.262@osu.edu
Office location: 1124 Derby
Office hours: Wednesdays 10:15-12:15, when my door is open, or by appointment

Response time: *I am typically readily accessible via **email**. While I try to prioritize communication, students should allow up to 2 full business days for responses.
Feedback for **graded items** should be expected no more than 7 days after the date of completion or due date – which ever is later.

Credit hours and work expectations: This is a **3-credit-hour course**. According to Ohio State policy, students should expect around 3 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 6 hours of homework (reading, exercises, research and assignment preparation, for example) to receive a passing grade.
Major Credit: This course satisfies 3-credits of electives that counts towards the 6 elective credits required for atmospheric science majors.

ZOOM INFO:
https://us02web.zoom.us/j/88940302313?pwd=RmdJUFZzMWpmbUhWOWxWeFlKRlBHUT09
Meeting ID: 889 4030 2313 Passcode: fX7EQ5

Course Materials and Technologies:

Textbook: Recommended Text:

Radar Meteorology: A First Course. By Rauber and Nesbitt. Published by Wiley Blackwell (ISBN: 9781118432624)

Recommended course equipment: In order to complete activities (in-class and remote), it is strongly recommended that you purchase a digital pen that will allow you to write directly on the digital word document assignments from a pad or laptop. I recommend the XP Pen DECO 01.

Goals and Expected Learning Outcomes:

Students should be able to do the following upon successful completion of this course:

1) Explain how a radar works (generates, transmits, and receives electromagnetic energy)
2) Describe how data are converted from a return signal to the pixel value seen on a data display.

3) Interpret radar imagery from a variety of traditional and polarimetric radar-derived variables (e.g. reflectivity, radial velocity, spectrum width, Z_{DR}, correlation coefficient)
4) Identify and interpret specific atmospheric features and signatures observed from radar data (severe storms, atmospheric waves, winter weather features).
5) Describe alternative atmospheric observation methods (e.g. dual-Doppler analysis, VAD, vertical profilers) that can be performed by radars (what they are, when they are used, limitations, etc)

Grading: Final grades will be assigned according to the standard system and **will not be curved** (In other words, if you have an 89.4% you earn a B+):

Grade Scale

A	A-	B+	B	B-	C+	C	C-	D+	D	E
>92.5%	89.5 – 92.5%	86.5 – 89.5%	82.5 – 87.5%	79.5 – 82.5%	76.5 – 79.5%	72.5 – 76.5%	69.5 – 72.5%	66.5 – 69.5%	59.5 – 67.5%	<59.5%

Assessment:
Exams (2): 30%
Weekly Assignments/Activities: 25%
Weekly quizzes (in class): 20%
Final Project: 15%
Class participation: 10%

***Exams (30%)*:** There will be two midterm exams (15% each) during the semester (tentatively 9/28, and 11/4). Exams will be a combination of multiple choice, true/false, definitions, short answers, application problems, and long answers and will be out of 100 points.
Assignments (25%): Nearly every week (except for weeks with exams) there will be an assignment **due** on SUNDAY at 10:00 pm, the following week. These assignments are to be UPLOADED TO Carmen and will be completed through the combined effort of in-class group work and individual work. Most weeks, assignments will be handed out on Monday for groups to begin completing together. Assignments will be a mixture of conceptual problems that must be explained, computational problems where math and physical equations must be used to arrive at a numeric answer, and application-based problems where radar data are shown and you must analyze and interpret the imager. Assignments that are turned in late will be subject to a 5% deduction per day late. Unless prior arrangements have been made with Dr. Houser, assignments that are not handed in by 10:00 PM on the Thursday after they are due will receive a 0. You MAY work with others when completing the assignment, but you MUST DO YOUR OWN WORK. Students suspected of copying will be notified and penalized in accordance with university regulations. I recommend you bring a laptop or tablet to class to begin working on assignments.
***Weekly quizzes (20%)*:** At the beginning of every **Monday's** class, there will be a quiz that will evaluate students' preparation for that week's material. The quiz will be taken twice, back to back, once independently and once in your group. Both grades will count for credit according to the percentages determined the first day of class. If you are absent, you can make arrangements to take the quiz individually if you contact me **within 24 hours** of the absence. If you are absent, your individual grade will also count as your group grade. You can have **two makeups** during the semester. If you are late to class, you will NOT be granted extra time to complete your quiz. Your lowest quiz grade (only 1) will be dropped.
Final Project (15%): In place of a final exam, there will be a final project that will be assigned in mid October. The project will require students to use data collected by the OSU mobile radar to successfully accomplish a variety of tasks including visualizing the data, interpreting the data, implementing a hydrometeor classification scheme, and performing a dual-Doppler analysis. Knowledge of computer coding will be required to successfully complete this project.
***Class participation (10%)*:** This is graded based upon group evaluation twice per semester. Each group member will anonymously evaluate the other members' preparation and participation in group quizzes and activities.

The average of an individual's responses will be used as this grade unless there is an obvious outlier in the evaluations. See Group Evaluation Rubric handout or BB document.
Attendance: While attendance is not directly a factor in student's grade, there will be graded materials almost every class period. If a student misses a class, they will receive a 0 for their quiz or activity for that day unless they have contacted me in accordance to the statements in the 'Quizzes' and 'Assignments' sections above unless a longer medical leave is granted by a university physician. Other class members are not to be consulted about information presented in makeups. Only two such makeups will be allowed during the semester except for extenuating circumstances. After two missed classes, students will receive a 0 for missed materials.

How This Course Works:

Class Time: STUDENTS ARE EXPECTED TO COME TO CLASS **ON MONDAY** HAVING READ THE LECTURE/READING MATERIAL FOR THE WEEK.
Course material will be available on blackboard (Under 'content' section) by the end of the day Friday for the following week. Class will begin AT 12:00 whether you are here or not. Please try not to be late.
Monday's Class: We will begin by taking a quiz to guarantee your preparation for class. Following a discussion of the quiz, I will poll the class about what material was most confusing from that week's notes. Lecture will be tailored to address student questions and concepts that students do not understand. I will NOT be going over each slide verbatim and there will be topics on slides that are NOT discussed during class time. Toward the end of class, the week's activity will likely be handed out and students will begin working on it.
Wednesday's Class: Additional lecture material may be presented based upon the class's understanding of material given on Tuesday. We will do group discussion questions to review material and discuss as needed. All remaining time will be dedicated to working on weekly assignments within your group.
*Please note: The class schedule may change from week-to-week depending upon pace and content understanding. However, quizzes will ALWAYS be on Mondays.

Other Details, Policies and Procedures:

1. Classes will begin AT 12:45 whether you are here or not. Please try not to be late as this disrupts the class environment.
2. **Make-up exams will only be allowed if arrangements have been made PRIOR TO the exam date** and will only be accepted for extenuating circumstances.
3. Grades and course materials will be updated and posted on Canvas.
4. If you have special needs for any reason, I will only be able to grant you special permissions if you have the appropriate documentation of your disability and your needs.
5. **Cell phones and other electronic devices ARE ONLY PERMITTED** for use in the classroom or the lab for polling purposes, for completing assignments or if you have a specific need that requires their use. In such situations please notify me of your need and provide any university documentation that supports it.
6. **Students are expected to have their cameras ON during the entire duration of Zoom meetings if you are remotely attending.** I do not care if you just rolled out of bed, or if you are in last night's clothes, but I want to see your face, as do your classmates.
7. **Students are expected to treat each other courteously and professionally. Students who compromise the effectiveness of the learning environment will be asked to leave.**

Academic integrity policy

- Written assignments: Students' written assignments, should be their own original work. For the pretrip assignments, group work IS allowed and encouraged, but written answers must be personal and unique. Copying another's work is not permitted.
- Reusing past work: In general, students are prohibited in university courses from turning in work from a past class, even if modified. Students should discuss the situation with instructors in advance if there is any doubt.

- Final project: This should be an individual, independently executed project. Team work is prohibited.
- AI policy: Use of AI for any portion of your work is strictly prohibited. Written assignments, journals, and final projects must be YOUR personal work and writing.

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-48.7 (B)). For additional information, see the Code of Student Conduct.

*PLEASE NOTE: HAVING ANOTHER PERSON COMPLETE OR PROVIDE YOU WITH ANSWERED ASSIGNMENT OR EXAM QUESTIONS, INCLUDING MATERIALS FROM PAST YEARS IS CONSIDERED CHEATING **BY BOTH PARTIES** AND IS GROUNDS FOR ACADEMIC DISCIPLINE RANGING FROM RECEIVING A 0 ON THE ASSIGNMENT TO FAILURE OF THE COURSE
If a student is caught cheating *in any capacity* on any material, disciplinary action will be taken.

Disability Services

- The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.
- If you are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let me know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Religious Accommodations

- Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.
- With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.
- A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a

course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.
- If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Office of Institutional Equity. (Policy: Religious Holidays, Holy Days and Observances)

Your mental health

- As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292--5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Statement on Title IX

- Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu.

Statement on Diversity

- The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Carmen Access

You will need to use BuckeyePass multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions.
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click Enter a Passcode and then click the Text me new codes button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357 (HELP) and IT support staff will work out a solution with you.

Course Outline:
***This is subject to change based upon lecture/classroom pace and unforeseen circumstances**

Week	*Class Dates*	*Topics*	*Relevant Book Content*	*Assignment, Quiz*
1	8/19	Intro to Radar, Electromagnetic fields, Maxwell's Eqs, Operational Radar Network	Chapter 1.1, 1.2, Ch 10	Practice quiz
2	8/24, 8/26	Properties of electromagnetic waves and wave propagation, Scattering properties	1.3, 1.4, 1.5	Quiz 1 HW 1 due 8/30
3	8/31, 9/2	Radar hardware, Radar characteristics, Radar Path	Chapters 2, 3.1, 3.3, 3.4, 4.1, 4.2	Quiz 2 HW 2 due 9/6
4	9/7, 9/9	9/7 – No Class Radar Artifacts and challenges: Ground Clutter, Range Folding, AP, Attenuation	Chapters 3.2, 4.3, 8.1, 8.2, 9.1	Quiz 3 HW 3 due 9/13
5	9/14, 9/16	Power, Reflectivity, Radar equation for point targets, Radar equation for distributed targets	Chapter 5	Quiz 4 HW 4 due 9/20
6	9/21, 9/23	Doppler Velocity, Doppler Patterns, Doppler Spectrum, Signal Processing, Velocity aliasing	Chapter 6, Chapter 11.1, 11.3	Quiz 5 HW 5 – PRACTICE
7	9/28, 9/30	**9/28: Exam 1, all material through 9/23** 9/30: Dual Pol Intro	Chapter 7.1, 7.2, 7.3	No Quiz No HW
8	10/5, 10/7	Dual Polarization Variables, Interpreting Dual-Pol Patterns and Signatures	Ch 7.4, -7.5.5, 7.5.8	Quiz 6 HW 6 due 10/11
9	10/12, 10/14	Hydrometeor Classification, QPE	7.5.6-end of chapter, 13.1, 13.3, 13.4 13.5.	Quiz 7 HW 7 due 10/18
10	10/19, 10/21	Severe Storms Interpretation	Chapter 14	Quiz 8 HW 8 due 10/25
11	10/26, 10/28	Interpreting radar patterns of severe storms	Chapter 14	Quiz 9 HW 9 due 11/1
12	11/2, 11/4	Interpreting winter weather and midlatitude cyclone patterns	Chapter 15	Quiz 10 HW 10 due 11/8
13	11/9, 11/11	Applications for Winter weather and Waves **11/11: No Class (Vetran's Day)**		Quiz 11 HW 11 due 11/15
14	11/16, 11/18	Interpreting Tropical Cyclones and waves	Chapter 16	Quiz 12 HW 12 due 11/22
15	11/23	**11/23 Exam 2, all material from 9/30-11/18** **11/25 – No class: Thanksgiving break**		No Quiz No HW
16	11/30, 12/2	Additional Applications: VAD, Dual Doppler Analyses, Cloud radars and vertical profilers	Chapter 11.4, 11.5, 12.1, 12.2, 12.4, 17.1, 17.2, 17.3.1	Quiz 13 No HW, work on project
17	12/7, 12/9	**Work on Final Projects (Based upon the Mobile Radar Data)**		No Quiz No HW, work on project
18	12/ 11	**Final Projects Due 5:00 PM**		