Measurements in Atmospheric Sciences (ATMOSSC 5302)
Course Details Document
Fall 2026
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Simple Syllabus: **https://osu.simplesyllabus.com/doc/2ev33f124/Autumn-2026-ATMOSSC-5302-22480-Measurements-in-Atmospheric-Sciences?mode=view**

Office Hours: My office hours will be held Thursday (9 to 11 am) and by appointment. If you are not available during my regular office hours, please feel free to contact me to setup a meeting at a time that works for you.

Teaching Assistant: Dominic Bentley
Office: 1155 Derby Hall
Email: bentley.294@buckeyemail.osu.edu
Dominic's office hours will be Monday (3 to 4 pm), Wednesday (10 am to 11 am) and by appointment.

Lectures: Friday, 1:50 p.m. – 5:05 p.m., 070 Derby Hall

Course Materials:
Readings will be provided from the following textbooks via Carmen:
Meteorological Measurement Systems, 2001, Brock and Richardson, ISBN-13: 9780105134513.
An electronic version of this book is available through the OSU library:
https://app.knovel.com/kn/resources/kpMMS00003/toc

Boundary Layer Climates, 2nd Edition (1987), Oke, ISBN-13: 9780415043199
An electronic version of this book is available through the OSU library:
http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=74015

Other assigned readings (journal articles, sensor instruction manuals, etc.) will also be made available on Carmen.

Class Website: carmen.osu.edu

Course Objectives:
This course serves as an introduction to microclimatological instrumentation and fieldwork. We will learn about various environmental sensors: how they work, how they should be deployed, how to retrieve and process information from them, and how to interpret the data they produce.

For each meteorological variable the lectures will provide an overview of:
a) Importance of the measurements. How are the measurements used?
b) Instruments and how they work. How are measurements made?

c) Application of knowledge through hands-on data collection with both basic and advanced instruments (in-class exercise)

The in-class exercises will give students the opportunity to apply these principles by making measurements in the field. The research project will provide students with the opportunity to design an experiment and to collect data to answer a research question that is of interest to them.

We will cover the following meteorological variables this semester:

1) Air temperature (sling psychrometer; thermometer, thermistor)
2) Surface temperature (IR temperature; Infrared camera)
3) Humidity (sling psychrometer; hygrometer)
4) Precipitation
5) Solar radiation and net radiation
6) Soil moisture and soil temperature
7) Sonde (atmospheric sounding system)
8) Various other meteorological sensors
9) Dataloggers and datalogger programming

Learning Objectives:
As a result of taking this course you should know certain things (knowledge objectives) and be able to do certain things (skill objectives).

Knowledge objectives (Things you should know by the end of the course):

- Describe the processes that are responsible for energy, moisture and momentum exchange between the surface and the atmosphere
- Describe the spatial and temporal variations in each component of the near-surface atmosphere, surface energy and moisture budgets, and the physical processes that are responsible for these patterns
- Describe how each component of the surface energy and moisture budget are measured using sensors and the calibration, limitations, uncertainty/biases in the measurements and the standards observed for its deployment
- Evaluate how human activities influence moisture and energy fluxes in the boundary layer at local, regional and global scales
- Evaluate how human activities are influenced by moisture and energy fluxes in the boundary layer at local, regional and global scales
- Critically evaluate and identify sources of uncertainty in measurements of surface energy and water exchanges

Skill objectives (Things you should be able to do by the end of the course):

- Measure and interpret meteorological variables and the surface energy budget
- Deploy sensors in accordance with accepted observational standards and collect measurements using a data logger
- Quantify the influence of site characteristics on energy, moisture and momentum fluxes
- Use Python to visualize data using maps and graphs
- Generate graphs and maps for your group project and oral presentation
- Write a scientific report that answers a research question based on an analysis of data. This paper will conform to the standard for publication in a peer-reviewed journal
- Develop a scientific poster that summarizes your research questions, data and methods, results and conclusions in a visually effective manner

- Deliver a clear and concise oral presentation of the research that you completed during the semester

Grading:
Your grade will be calculated as follows:

Exercises (8)	35%
Participation	10%
Midterm Exam	20%
Group Project	35%

Exercises (35%)
The exercises will require you to apply what you learn in this class. There will be 8 exercises assigned during the semester. The exercises will be assigned one week before they are due. You need to be in class to make the measurements that are associated with the exercises. If you do not attend class, you will not have the data you need to complete the exercises. While we will be doing data collection in groups, the exercises are individual assignments and each student must submit their own work. However, you may discuss the questions and work collaboratively. Your exercises will be submitted on Carmen. **There are no makeup assignments and late submissions are not accepted.**

Exercise #1: Measuring temperature using multiple methods; Due Sept. 4
Exercise #2: Temperature and relative humidity profiles; Due Sept. 11
Exercise #3: Solar radiation and net radiation; Due Sept. 18
Exercise #4: Wind speed and direction; Due Oct. 2
Exercise #5: Soil moisture; Due Oct. 9
Exercise #6: Atmospheric sounding; Due Oct. 9
Exercise #7: Precipitation; Due Oct. 23
Exercise #8: Air quality; Due Nov. 6

Participation (10% each)
As a field-based class, it is important for you to attend every class and to be actively engaged throughout the class. This means every student should be actively participating in all aspects of the equipment setup, data collection, and analysis. You should plan on the class requiring the entire scheduled time (until 5:05 pm). Student participation grades will be determined by the instructor and through peer evaluation.

Midterm Exam (20%)
The midterm exam will be held in class on October 23. It will be based on the material covered in the lectures, readings, and exercises. The exam will involve hands-on applications, problem solving, and paragraph/essay questions. This is a practical exam that will assess your skills and knowledge based on the exercises that you have done in the course to date.

*Barring extraordinary circumstances, there will be no make-up exams. Written documentation will be required and verified before a make-up exam will be considered. Students must contact the instructor **prior** to any exam to be considered for a make-up exam.*

Group Project (35%)
The group project will provide you with an opportunity to design and implement a field experiment to answer a research question related to micrometeorology. This project will be an opportunity to

utilize the instruments and data collection skills that you have developed over the semester. This will be a group project. We will assign you to a group. Each group will develop a research question, design a field experiment, collect data, analyze the data and write a project report that summarizes the research question, data and methods, and results of your analysis. Part of your grade for the group project will be based on peer assessment. This is to ensure that each student contributes to the project.

The required components of the group project are:

(1) Abstract (Sept. 1)
(2) Project proposal (Sept. 25)
(3) Poster Presentation (Dec. 4)
(4) Project Report (Dec. 11)

Abstract (upload to Carmen on Sept. 1; due to AMS on Sept. 3)

Each year we take students to the Student Conference at the Annual Meeting of the American Meteorological Society to present the research that they completed in this class. We are planning to do this again this year. Each of the group projects that are completed this semester will be presented at the AMS meeting. This year the AMS Student Conference is January 9 to 10 and the Annual Meeting is January 10 to 14. For those students who are interested and available to attend the AMS, we plan to fly to Denver on Jan. 8 and return to Columbus on Jan. 14. We expect that travel, registration and accommodations will again be covered by the Department of Geography (still to be confirmed). The abstract deadline for the Student Conference is Sept. 3. The abstract is an ~200 word description of the significance, research question and expected results.

Project Proposal (5%)

Each research group will generate a project proposal that provides an overview of the problem statement, background, research question and proposed experimental design. This research proposal is a road map or plan for how to answer your research question. A rubric will be handed out in class that provides more detail on the organization and length of the proposal. The project proposal is due on Sept. 25 (worth 5% of final grade).

Poster Presentation (10%)

Each group will present their results at the end of the semester in a poster session on Friday, December 4. I will invite faculty and grad students from our department to attend the presentations. Each group will give a short overview (5 minutes or less) of their results and then we will provide time for faculty and grad students to circulate and ask questions. The posters should include a description of your research question, datasets and methods, results and conclusions. Presentations will be given in class on Friday, December 4 (worth 10% of your final grade). I will distribute a grading rubric and discuss the requirements in more detail during the semester. The focus of a poster is on effect visual (and oral) communication.

Project Report (20%)

Each group will generate a project report that provides a detailed written description of your research question, datasets and methods, results and conclusions. The report will contain some of the same information as the poster, but it will have a more detailed literature review, discussion section and it may contain results (graphs and maps) that you did not have space to include on your poster. The report should also outline the limitations of your analysis and potential future research. The project report is due on Friday, December 11 (worth 20% of your final grade).

The grading scale is:

A	= 93 to 100%
A-	= 90 to 92%
B+	= 87 to 89%
B	= 83 to 86%
B-	= 80 to 82%
C+	= 77 to 79%
C	= 73 to 76%
C-	= 70 to 72%
D+	= 67 to 69%
D	= 63 to 66%
D-	= 60 to 62%
E	= <59%

Expectations of students

- Attend all classes, be on time, and actively participate in the class.
- Class exercises involves group work. You need to be in class to make the measurements that are associated with the exercises. If you do not attend class, you will not have the data you need to complete the exercises.
- You will be responsible for understanding all the material covered in lecture and that is part of the assignments.
- Complete all assignments.
- Read assigned material. Wider reading is encouraged.
- Submit assignments on time. **No late assignments will be accepted.**
- Some material that will be presented in class is not in the textbook, so make arrangements to get notes if you are absent.

Class Policies

- Class lectures will not be recorded or broadcast on Zoom. In person attendance is required to successfully complete this class. If you miss class, you are responsible for getting lecture notes and any other materials that you missed from one of your classmates
- No private conversations or other distracting behavior will be tolerated.
- All cellphones must be silent during class. Please refrain from email/texting during class.

Ohio State's Academic Integrity Policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university's *Code of Student Conduct*, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the university or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the university's *Code of Student Conduct* is never considered an excuse for academic misconduct, so I recommend that

you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- The Committee on Academic Misconduct web pages (COAM Home)
- *Ten Suggestions for Preserving Academic Integrity (Ten Suggestions)*
- *Eight Cardinal Rules of Academic Integrity* (www.northwestern.edu/uacc/8cards.htm)

Copyright Disclaimer
The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

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 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.

Accessibility accommodations for students with disabilities

Requesting Accommodations

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**.

Accessibility of course technology

This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- CarmenCanvas accessibility
- CarmenZoom accessibility

Artificial Intelligence Policy
All students have important obligations under the Code of Student Conduct to complete all academic and scholarly activities with fairness and honesty. Our professional students also have the responsibility to uphold the professional and ethical standards found in their respective academic honor codes. Specifically, students are not to use "unauthorized assistance in the laboratory, on field work, in scholarship or on a course assignment" unless such assistance has been authorized specifically by the course instructor. In addition, students are not to submit their work without acknowledging any word-for-word use and/or paraphrasing" of writing, ideas or other work that is not your own. These requirements apply to all students — undergraduate, graduate, and professional.

To maintain a culture of integrity and respect, these generative AI tools should not be used in the completion of course assignments unless an instructor for a given course specifically authorizes their use. Some instructors may approve of using generative AI tools in the academic setting for specific goals. However, these tools should be used only with the explicit and clear permission of each individual instructor, and then only in the ways allowed by the instructor. In accordance with this policy, in our course we will use (and not use) AI in the following ways: (1) coding/programming assistance. **It is permissible to use AI to help write code and debug code. This includes python code that is used for generating plots and analysis for the exercises and data logger programs. (2) Literature search. It is permissible to use AI to help find peer-reviewed journal articles for your group project. (3) Miscellaneous. You can use AI to learn about course concepts, find resources or data, or other similar searches.**

If you are not sure if a tool you wish to use is permitted for this course, please contact me to discuss it first.

Class Schedule

The following course schedule is tentative and it may change (due to weather conditions or other factors) as the class evolves. ***The exam, assignment and project dates are fixed****.*

Date	Lecture	Location
28-Aug	**Syllabus and Introduction; Measurement Temperature (Ex. #1)** *Due: Project Abstract (Sept. 1)*	DB 070
4-Sep	**Dataloggers; Temperature and Relative Humidity Profiles (Ex. #2)** *Due: Exercise #1*	DB 070
11-Sep	**Solar Radiation and Net Radiation (Ex. #3)** *Due: Exercise #2*	DB 070
18-Sep	**Atmospheric Windspeed Profiles (Ex. #4)** *Due: Exercise #3*	Waterman
25-Sep	**Soil Moisture (Ex. #5)** *Due: Project Proposal*	Waterman
2-Oct	**Precipitation (Ex. #6)** *Due: Exercise #4*	DB 070
9-Oct	**Atmospheric Sounding (Ex. #7)** *Due: Exercise #5 and #6*	DB 070
16-Oct	**NO CLASS - Fall Break**	
23-Oct	**Midterm exam** *Due: Exercise #7*	DB 070
30-Oct	**Measuring Air Quality (Ex. #8)**	DB 070
6-Nov	**Introduction to Instrument Siting & Group Work** *Due: Exercise #8*	DB 070
13-Nov	**Introduction to Data Quality Control & Group Work**	DB 070
20-Nov	**Project Reports & Group Work**	DB 070
27-Nov	**NO CLASS - Thanksgiving**	
4-Dec	**Poster Presentations** *Due: Poster Presentation (Dec. 4th), and Project Report (Dec. 11th)*	DB 070