

# Ecological Climatology

[ENR 3240] [Spring 2025]

## Course Information

- **Course times and location:** Mondays and Wednesdays, 3:00 pm – 4:20 pm
- **Credit hours:** 3
- **Mode of delivery:** Two in person lectures per week

## Instructor

- **Name:** Yanlan Liu
- **Email:** liu.9367@osu.edu
- **Office location:** Orton Hall 251
- **Office hours:** Mondays 4:20 pm – 5:20 pm, Kottman Hall 116, or by appointment
- **Preferred means of communication:**
  - My preferred method of communication for questions is **email**.
  - My class-wide communications will be sent through the Announcements tool in CarmenCanvas. Please check your [notification preferences](https://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to be sure you receive these messages.

## Course Prerequisites/Co-Requisites

None.

## Course Description

This course focuses on physical and ecological principles that shape water-carbon-energy cycles and vegetation dynamics in natural terrestrial ecosystems. Students will learn the fundamentals of how hydrology and plant activity regulate each other, and how the plant-water interactions feedback to surface energy and carbon budgets. Specific topics include surface energy budget, evapotranspiration, plant water stress, biosphere response to drought, biosphere carbon budget, and vegetation feedbacks to the atmosphere. We will use examples of real-world applications throughout the course. In addition, students will get hands-on experience analyzing ecohydrological datasets based on ground and remote sensing measurements.



# Course Learning Goals and Outcomes

By the end of this course, students will:

- Understand the roles of natural vegetation in regulating hydrological cycle, terrestrial carbon budgets, and surface climate. As a result, students will be able to:
  - Outline components in terrestrial water-carbon-energy cycles regulated by plants.
  - Identify key principles of plant-water interactions that regulate ecosystem response and feedback to drought.
- Understand the tools and methods to diagnose biosphere-atmosphere interactions. As a result, students will be able to:
  - List methods and metrics that quantify biosphere-atmosphere fluxes, plant water stress, and vegetation dynamics.
  - Visualize and interpret ecohydrological datasets to monitor seasonal to interannual variabilities.

## How This Course Works

**Mode of delivery:** This course is taught in person. Students are expected to attend class each week during the scheduled meeting sessions. Assignments will be administered via Carmen as found on the course schedule. Exams will be completed during the scheduled sessions in a hand-written form.

**Pace of online activities:** This course is divided into **weekly modules** that are released one week ahead of time. Students are expected to keep pace with weekly deadlines but may schedule their efforts freely within that time frame.

**Credit hours and work expectations:** This is a 3 credit-hour course. According to [Ohio State bylaws on instruction](https://go.osu.edu/credithours) (go.osu.edu/credithours), students should expect around 3 hours per week of time spent on direct instruction in addition to 6 hours of reading and assignment.

### Attendance and participation requirements:

- **Participating in online activities for attendance: at least once per week**  
You are expected to log in to the course in Carmen every week. During most weeks you will probably log in many times. If you have a situation that might cause you to miss an entire week of class, discuss it with me *as soon as possible*. In the case of emergency or illness, contact the instructor as soon as possible to discuss possible accommodations at the discretion of the instructor and with appropriate documentation.
- **Zoom meetings and office hours: optional**  
Office hours are optional. I will post the recordings of lectures for those who cannot attend and inform me via email at least 24 hours ahead.



# Course Materials, and Technologies

## Required Materials and/or Technologies

- Bonan, G. (2015). *Ecological Climatology*. Cambridge University Press. [open online access at <https://doi.org/10.1017/CBO9781107339200>]
- Journal articles for reading [all available online through university library]
  - Baldocchi et al. (2001). FLUXNET: A new tool to study the temporal and spatial variability of ecosystem-scale carbon dioxide, water vapor, and energy flux densities." *Bulletin of the American Meteorological Society* 82(11): 2415-2434.
  - Brodrribb et al. (2020). Hanging by a thread? Forests and drought. *Science*, 368(6488), 261-266.
  - McDowell et al. (2019). Hydraulics in the 21st century. *New Phytologist*, 224(2), 537-542.

## Required Equipment

- **Computer:** current Mac or PC with high-speed internet connection.
- **Other:** a mobile device (smartphone or tablet) to use for BuckeyePass authentication

If you do not have access to the technology you need to succeed in this class, review options for [technology and internet access](https://go.osu.edu/student-tech-access) (go.osu.edu/student-tech-access).

## Required Software

**Microsoft Office 365:** All Ohio State students are now eligible for free Microsoft Office 365. Visit the [installing Office 365](https://go.osu.edu/office365help) (go.osu.edu/office365help) help article for full instructions.

## CarmenCanvas Access

You will need to use [BuckeyePass](https://buckeyepass.osu.edu) (buckeyepass.osu.edu) 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 do each of the following:

- Register multiple devices in case something happens to your primary device. Visit the [BuckeyePass - Adding a Device](https://go.osu.edu/add-device) (go.osu.edu/add-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.

- [Install the Duo Mobile application](https://go.osu.edu/install-duo) (go.osu.edu/install-duo) on 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 \(HELP\)](tel:614-688-4357) and IT support staff will work out a solution with you.

## Technology Skills Needed for This Course

- Basic computer and web-browsing skills
- [Navigating CarmenCanvas](https://go.osu.edu/canvasstudent) (go.osu.edu/canvasstudent)
- [CarmenZoom virtual meetings](https://go.osu.edu/zoom-meetings) (go.osu.edu/zoom-meetings)
- [Recording a slide presentation with audio narration and recording, editing and uploading video](https://go.osu.edu/video-assignment-guide) (go.osu.edu/video-assignment-guide)

## Technology Support

For help with your password, university email, CarmenCanvas, or any other technology issues, questions or requests, contact the IT Service Desk, which offers 24-hour support, seven days a week.

- **Self Service and Chat:** [go.osu.edu/it](https://go.osu.edu/it)
- **Phone:** [614-688-4357 \(HELP\)](tel:614-688-4357)
- **Email:** [servicedesk@osu.edu](mailto:servicedesk@osu.edu)

# Grading and Faculty Response

## How Your Grade is Calculated

Assignment Category	Points
Written Assignments	40%
Midterm exam	20%
Final exam	30%
Participation	10%

# Descriptions of Major Course Assignments

## Written Assignments

**Description:** There will be ten short written assignments (2-3 problems each), including conceptual questions and calculation exercises. All calculation exercises are solvable using hand calculation, calculator, and Microsoft Excel. Assignments will be due to the Carmen on Mondays by 5 pm and graded by Wednesday in the same week. All assignments and due dates are detailed on the Carmen page. Students have one chance to redo the assignments marked as incorrect and resubmit by the next Monday at 5 pm.

**Academic integrity and collaboration:** While students are encouraged to discuss about assignments, all that submitted must be their own work. Each student will independently submit all written assignments to Carmen. Midterm and final exams are scheduled on week 8 and during the course's scheduled final exam time during exam week, respectively, including both conceptual questions and calculations. Exams will be open book, including notes, textbooks, and websites, but must be completed independently by each student without discussion with others.

## Late Assignments

Please refer to Carmen for due dates. Due dates are set to help you stay on pace and to allow timely feedback that will help you complete subsequent assignments. Due to the collaborative nature of class discussions, I am not able to grade posts submitted after the final weekly deadline for this assignment type. In the case of documented emergency or illness, or in the case of an excused absence that has been discussed with the instructor in advance, assignment due-dates may be adjusted at the discretion of the instructor.

## Instructor Feedback and Response Time

I am providing the following list to give you an idea of my intended availability throughout the course. Remember that you can call [614-688-4357 \(HELP\)](tel:614-688-4357) at any time if you have a technical problem.

- **Preferred contact method:** If you have a question, please contact me first through my Ohio State email address. I will reply to emails within 24 hours on days when class is in session at the university.
- **Class announcements:** I will send all important class-wide messages through the Announcements tool in CarmenCanvas. Please check [your notification preferences](http://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to ensure you receive these messages.
- **Grading and feedback:** For assignments submitted before the due date, I will try to provide feedback and grades within the same week. Assignments submitted after the due date may have reduced feedback and grades may take longer to be posted.



## Grading Scale

93–100: A    90–92.9: A-    87–89.9: B+    83–86.9: B    80–82.9: B-    77–79.9: C+  
 73–76.9: C    70–72.9: C-    67–69.9: D+    60–66.9: D    < 60: E

## Course Schedule

Refer to the CarmenCanvas course for up-to-date due dates.

Week	Lecture Topics	Assignment/exam	Readings
1	Ecosystems and climate		Bonan, Chapter 1
2	Surface energy fluxes	Assignment 1	Bonan, Chapter 12
3	Evapotranspiration & water balance	Assignment 2	Bonan, Chapter 10
4	Flux measurements	Assignment 3	Baldocchi et al. (2001)
5	Soil moisture & plant water stress	Assignment 4	Bonan, Chapter 14
6	Atmospheric moisture demand	Assignment 5	Bonan, Chapter 14
7	Plant water storage & transport	Assignment 6	McDowell et al. (2019)
8	Biosphere response to drought	Midterm exam	Brodribb et al. (2020).
9	Canopy phenology	Assignment 7	Bonan, Chapter 17
10	Spring break		
11	Seasonal to interannual variability	Assignment 8	Bonan, Chapter 26
12	Plant carbon budget	Assignment 9	Bonan, Chapter 29
13	Ecosystem carbon budget	Assignment 10	Bonan, Chapter 29
14	Vegetation feedback to climate	Assignment 11	Bonan, Chapter 27
15	Remote sensing of ecohydrology		
16	Final exam review	Final exam	



# Other Course Policies

## Academic Integrity Policy

See [Descriptions of Major Course Assignments](#) for specific guidelines about collaboration and academic integrity in the context of this online 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.

## Copyright for Instructional Materials

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.



# Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:

1. Online reporting form at [equity.osu.edu](https://equity.osu.edu),
2. Call 614-247-5838 or TTY 614-688-8605,
3. Or Email [equity@osu.edu](mailto:equity@osu.edu)

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Office of Institutional Equity to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member."

## Diversity

The Ohio State University affirms the importance and value of diversity of people and ideas. We believe in creating equitable research opportunities for all students and to providing programs and curricula that allow our students to understand critical societal challenges from diverse perspectives and aspire to use research to promote sustainable solutions for all. We are committed to maintaining an inclusive community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among all members; and encourages each individual to strive to reach their own potential. The Ohio State University does not discriminate on the basis of age, ancestry, color, disability, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, race, religion, sex, gender, sexual orientation, pregnancy, protected veteran status, or



any other bases under the law, in its activities, academic programs, admission, and employment.

To learn more about diversity, equity, and inclusion and for opportunities to get involved, please visit:

- <https://odi.osu.edu/>
- <https://odi.osu.edu/racial-justice-resources>
- <https://odi.osu.edu/focus-on-racial-justice>
- <http://mcc.osu.edu/>

In addition, this course adheres to **The Principles of Community** adopted by the College of Food, Agricultural, and Environmental Sciences. These principles are located on the Carmen site for this course; and can also be found at <https://go.osu.edu/principlesofcommunity>. For additional information on Diversity, Equity, and Inclusion in CFAES, contact the CFAES Office for Diversity, Equity, and Inclusion (<https://equityandinclusion.cfaes.ohio-state.edu/>). If you have been a victim of or a witness to a bias incident, you can report it online and anonymously (if you choose) at <https://equity.osu.edu/>.

## 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](https://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.

For students in the College of Food, Agricultural, and Environmental Sciences, David Wirt, [wirt.9@osu.edu](mailto:wirt.9@osu.edu), is the CFAES embedded mental health counselor on the Columbus campus. To contact David, please call 614-292-5766. Students should mention their affiliation with CFAES if interested in speaking directly with David.

# ACCESSIBILITY ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

## Requesting Accommodations

The university strives to make all learning experiences as accessible as possible. 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 \(SLDS\)](#). After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's [request process](#), managed by Student Life Disability Services.

## Disability Services Contact Information

- Phone: [614-292-3307](tel:614-292-3307)
- Website: [slds.osu.edu](http://slds.osu.edu)
- Email: [slds@osu.edu](mailto:slds@osu.edu)
- In person: [Baker Hall 098, 113 W. 12th Avenue](#)

## Accessibility of Course Technology

This online course requires use of CarmenCanvas (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 as early as possible.

- [CarmenCanvas accessibility](http://go.osu.edu/canvas-accessibility) ([go.osu.edu/canvas-accessibility](http://go.osu.edu/canvas-accessibility))
- Streaming audio and video
- [CarmenZoom accessibility](http://go.osu.edu/zoom-accessibility) ([go.osu.edu/zoom-accessibility](http://go.osu.edu/zoom-accessibility))

## Religious Accommodations

Our inclusive environment allows for religious expression. Students requesting accommodations based on faith, religious or a spiritual belief system in regard to examinations, other academic requirements or absences, are required to provide the instructor with written notice of specific dates for which the student requests alternative accommodations at the earliest possible date. For more information about religious accommodations at Ohio State, visit [odi.osu.edu/religious-accommodations](http://odi.osu.edu/religious-accommodations).

## Weather or other short-term closing

### In-person courses

Should in-person classes be canceled, we will meet virtually via CarmenZoom during our regularly scheduled time. I will share any updates via CarmenCanvas.

