

# Soils and Climate Change Syllabus

ENR 5268 and EARTHSC 5268 Spring 2022

## Course Information

- **Course times and location:** Mondays/Wednesdays, 2:20 p.m.-3:40 p.m. in AA0246
- **Credit hours:** 3
- **Mode of delivery:** In person

## Instructors

- **Name:** Rattan Lal
- **Email:** [lal.1@osu.edu](mailto:lal.1@osu.edu)
- **Phone Number:** 614-292-9069
- **Office location:** 422B Kottman Hall
- **Name:** William Barry Lyons
- **Email:** [lyons.142@osu.edu](mailto:lyons.142@osu.edu)
- **Phone Number:** 614-688-3241
- **Office location:** School of Earth Sciences
- **Office hours:** Mondays 1:00 p.m. – 2:00 p.m. (Dr. Lal) and by appointment (Dr. Lyons)
- **Preferred means of communication:**
  - Our preferred method of communication for questions is **email**.
  - Our 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

There are no course prerequisites.

## Course Description

This course is designed for students interested in learning basic soil and geologic processes as they impact climate change and are impacted by it. The syllabus meets the curriculum needs of students in Soil Sciences, Earth Sciences, Environmental Sciences, Natural Resources, Food, Agricultural & Biological Engineering, Horticulture and Crop Sciences, Forestry, Architecture, Landscaping, Civil Engineering, Environmental Engineering, Public Policy, and Agricultural Economics.

## Learning Outcomes

By the end of this course, students should successfully be able to:

- Document soil and geological processes and address climate change issues
- Apply basic concepts to understand the following:
  - Greenhouse effect, geologic climate changes, and abrupt climate change
  - Global C cycle (global C cycle: geologic, current)
  - Gaseous emissions (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O)
  - Biogeochemical cycles (such as coupled cycles of C, N, P, S and H<sub>2</sub>O)
  - Carbon sequestration
  - Terrestrial and geologic sequestration and processes
- Measurement of soil C pool and fluxes
- Soil Quality and C Sequestration
- Biofuels
- Trading of C credits and the payments for ecosystem services
- Climate resolutions by UNFCCC Summit 21, 22, 25 and others
- Evaluate C-footprint of products and processes

## How This Course Works

**Mode of delivery:** This course is 100% virtual and online.

There is a required synchronous (real time) session in Zoom each week on Tuesdays and Wednesdays from 2:20-3:40 p.m. Attendance will be taken and each student will be expected to ask at least one question in response to weekly presentations.

The rest of your work is found in Carmen and can be completed around your own schedule during the week.

**Pace of online activities:** This course is divided into **weekly modules** with reading materials 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 (instructor content and Carmen activities, for example) in addition to 6 hours of homework (reading, studying, editing notes, and assignment preparation, for example) to receive a grade of C average.

**Attendance and participation requirements:** Because this is an online course, your attendance is based on your online activity and participation. Research shows regular participation is one of the highest predictors of success. With that in mind, I have the following expectations for everyone's participation:

- **Weekly Zoom lectures and discussion: Required**  
You are expected to attend weekly lectures and actively participate in virtual online discussions. If you have a situation that might cause you to miss an entire week of class, discuss it with me *as soon as possible*.
- **Participating in online activities for attendance: At least once per week**  
You are expected to log in to the course in Carmen every week to access readings and assignments. During most weeks you will probably log in many times.
- **Zoom meetings and office hours: Optional**  
My office hours are optional. I will post recordings of synchronous sessions for those who cannot attend.

# Course Materials, Fees and Technologies

## Required Reading Materials

- Online reading materials will be provided through Carmen

## Required Equipment

- **Computer:** current Mac (MacOS) or PC (Windows 10) with high-speed internet connection
- **Webcam:** built-in or external webcam, fully installed and tested
- **Microphone:** built-in laptop or tablet mic or external microphone
- **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
Attendance	10 (10% of grade)
Homework Set 1	20 (20% of grade)
Homework Set 2	20 (20% of grade)
Homework Set 3	20 (20% of grade)
Seminar Presentation	40 (40% of grade)

See [Course Schedule](#) for due dates.

## Descriptions of Major Course Assignments

### Homework Assignments

**Description:** Students will answer one page of questions for each of the three homework sets related to class topics selected by Dr. Lal and Dr. Lyons. They will be due within one week.

**Academic integrity and collaboration:** Your written assignments, including homework sets should be your own original work. In formal assignments, you should follow Chicago style to cite the ideas and words of your research sources. You are encouraged to ask a trusted person to proofread your assignments before you turn them in but no one else should revise or rewrite your work.

### Seminar Presentation

**Description:** Students will research and present one 20-minute seminar of a topic of their choosing that is related to the class content. Use of Microsoft PowerPoint or other visuals required.

One or possibly two students each Wednesday will present a seminar presentation and facilitate the discussion. A sign-up sheet for presentation dates will be circulated at the beginning of the semester.

**Academic integrity and collaboration:** Your presentation should be your own original work,

and all images and research sources used in the presentation should be carefully and properly cited in the PowerPoint or other visual format. You should follow Chicago or another standardized citation style to cite the ideas and words of your research sources. You are encouraged to ask a trusted person to proofread your assignments before you turn them in but no one else should revise or rewrite your work.

In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.

All research you will conduct in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.

## 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. Students are expected to make every effort to submit assignments on time. Please contact the instructors as soon as possible if an assignment will be late. Three or more missed classes may require documentation from a doctor or other source.

## 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](https://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to ensure you receive these messages.
- **Discussion board:** I will check and reply to messages in the discussion boards once mid-week and once at the end of the week.
- **Grading and feedback:** For assignments submitted before the due date, I will try to provide feedback and grades within **seven days**. 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  
Below 60: E



## Other Course Policies

### Discussion and Communication Guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

A significant component of our interactions in this class will occur through Zoom videoconferencing. Because this mode of discussion has benefits and challenges that differ from in-person class sessions, I want to share my expectations for how we will meet and communicate:

- **Technical Issues:** If you encounter a technical issue with Zoom during a session, first make sure you are using the latest version of Zoom. Next, contact the IT Service Desk at [go.osu.edu/it](http://go.osu.edu/it) or 614-688-4357(HELP). If issues continue, contact me after the session to learn how to make up for the missed content either via a recording or other means. I will not be able to address technical issues during a live session.
- **Preparation:** Come to the session having completed any readings or pre-work and be ready to have open, civil, and supportive discussions in video and chat spaces. I ask that you update your Zoom profile with your preferred name and add a picture with your face.
- **Participation:** At the start of our sessions, I will share specific expectations for how to use the chat, how to interact, and how to raise questions or concerns as we go. If you are unsure about expectations or are unsure about raising a question, please follow up with me afterward to make sure your questions are answered. Plan to be present during the entire class session as much as you are able. For some activities, I may ask you to share your faces on camera so that we can see each other and connect. Please feel encouraged to use a non-distracting [virtual background](#). Many students and instructors prefer not to share their remote spaces for a variety of reasons. Mute your microphone when others are talking to minimize background noise in the meeting.

If you have any concerns about participating in class over Zoom in this way, please let me know. My goal is to create a safe environment where we can benefit from seeing each other and connecting, but I want to prioritize your safety and well-being.

**Recordings:** I will be recording our meetings for the benefit of students who may need to be absent. These links will only be shared with students in our class, and only when a student contacts me to make this arrangement.

Your interaction with students and their interactions with each other are crucial components of students' success in an online class. Customize this section with statements that capture your expectations in the context of the particular technology media where you and students will be interacting.

These are additional guidelines for class communication and discussions:

- **Writing style:** Students should remember to write using good grammar, spelling, and punctuation. A more conversational tone is fine for non-academic topics.
- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online. I will provide specific guidance for discussions on controversial or personal topics.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say. For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.
- **Backing up your work:** Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.
- **Synchronous sessions:** During our Zoom sessions I ask you to use your real name and a clear photo of your face in your Carmen profile. During our full-group lecture time, you may turn your camera off if you choose. When in breakout rooms or other small-group discussions, having cameras and mics on as often as possible will help you get the most out of activities. You are always welcome to use the [free, Ohio State themed virtual backgrounds](http://www.osu.edu/downloads/zoom-backgrounds.html) (www.osu.edu/downloads/zoom-backgrounds.html). Remember that Zoom and the Zoom chat are our classroom space where respectful interactions are expected.

## 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](http://studentconduct.osu.edu) (studentconduct.osu.edu), 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:

- [Committee on Academic Misconduct](http://go.osu.edu/coam) (go.osu.edu/coam)
- [Ten Suggestions for Preserving Academic Integrity](http://go.osu.edu/ten-suggestions) (go.osu.edu/ten-suggestions)
- [Eight Cardinal Rules of Academic Integrity](http://go.osu.edu/cardinal-rules) (go.osu.edu/cardinal-rules)

## 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. Materials may be given through a link or reference so that students may access them securely through the library.

## 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."

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://studentlife.osu.edu/bias/report-a-bias-incident.aspx>.

## 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. No matter where you are engaged in distance learning, The Ohio State University's Student Life Counseling and Consultation Service (CCS) is here to support you. If you find yourself feeling isolated, anxious or overwhelmed, [on-demand mental health resources](https://go.osu.edu/ccsondemand) ([go.osu.edu/ccsondemand](https://go.osu.edu/ccsondemand)) are available. You can reach an on-call counselor when CCS is closed at [614- 292-5766](tel:614-292-5766). **24-hour emergency help** is available through the [National Suicide Prevention Lifeline website](https://www.nationalsuicideline.org/) ([suicidepreventionlifeline.org](https://www.nationalsuicideline.org/)) or by calling [1-800-273-8255\(TALK\)](tel:1-800-273-8255). [The Ohio State Wellness app](https://go.osu.edu/wellnessapp) ([go.osu.edu/wellnessapp](https://go.osu.edu/wellnessapp)) is also a great resource.

# 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))

## Course Schedule

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

(RL) indicates that Dr. Lal will lead the lecture and facilitate discussion; (BL) indicates that Dr. Lyons will lead the lecture and facilitate discussion.

Seminar presentations will occur each Wednesday, according to the sign-up sheet.

Week	Date	Topics, Readings, Assignments, Due Dates
1	Jan 10 M	<b>Lecture:</b> Greenhouse Effect and the Global Carbon Cycle: Current (RL)
	Jan 12 W	<b>Presentation and Discussion:</b> Global Warming versus the Greenhouse Effect (RL)
2	Jan 19 W	<b>Lecture:</b> Short-Term - Carbon Cycle: Geologic (RL)
3	Jan 24 M	<b>Lecture:</b> Long-Term Carbon Cycle (BL)
	Jan 26 W	<b>Lecture:</b> Long-Term Carbon Cycle (BL)
4	Jan 31 M	<b>Presentation and Discussion:</b> Onset of the Anthropocene (RL)
	Feb 2 W	<b>Lecture:</b> C Sequestration Strategies: Terrestrial Sequestration (RL)
5	Feb 7 M	<b>Presentation and Discussion:</b> Pros and Cons of Different C Sequestration Options (BL)
	Feb 9 W	<b>Lecture:</b> Past Climate Change and Abrupt Climate Change (BL)

6	Feb 14 M	<b>Presentation and Discussion:</b> Past Climate Change and Abrupt Climate Change (BL)
	Feb 16 W	<b>Lecture:</b> Land Use and Historic C Loss (RL) <b>Homework 1 Assigned</b>
7	Feb 21 M	<b>Presentation and Discussion:</b> Soil/Terrestrial Carbon Sequestration Potential (RL)
	Feb 23 W	<b>Presentation and Discussion:</b> Low-C or No-Carbon Farming (RL)
8	Feb 28 M	<b>Lecture:</b> Soil Erosion and the Global Carbon Cycle (RL) <b>Homework 2 Assigned</b>
	Mar 2 W	<b>Lecture:</b> Fossil Fuel Emissions and Geologic Sequestration (BL)
9	Mar 7 M	<b>Presentation and Discussion:</b> Fossil versus Renewable (Non-Carbon) Energy (BL)
	Mar 9 W	<b>Lecture:</b> Soil Management and the Positive Ecosystem C Budget (RL)
10	Mar 14 M	<b>Instructional Break (No Classes)</b>
	Mar 18 F	
11	Mar 21 M	<b>Presentation and Discussion:</b> Erosion
	Mar 23 W	<b>Lecture:</b> Permafrost Soils and the Positive Feedback (RL) <b>Homework 3 Assigned</b>
12	Mar 28 M	<b>Presentation and Discussion:</b> Fate of C in Permafrost Ecosystems (RL)

	<b>Mar 30</b> W	<b>Lecture: Fate and Transport of C in Aquatic Ecosystems (BL) Homework 2 Due</b>
<b>13</b>	<b>Apr 4</b> M	<b>Lecture: Soil Erosion and Gaseous Emission (RL)</b>
	<b>Apr 6</b> W	<b>Presentation and Discussion: Managing Aquatic Ecosystems as Sinks of C: Class Discussions (BL)</b>
<b>14</b>	<b>Apr 11</b> M	<b>Lecture: Biogeochemical Processes and the Global Carbon Cycle (BL)</b> <b>Homework 3 Due</b>
	<b>Apr 13</b> W	<b>Presentation and Discussion: Biogeochemical Processes and the Global Carbon Cycle (BL)</b>
<b>15</b>	<b>Apr 18</b> M	<b>Lecture: Managing Soil Carbon, Biofuels Feedstock, Biochar, and Trading Carbon (RL)</b>
	<b>Apr 20</b> W	<b>Presentation and Discussion: Re-carbonization of the Terrestrial Biosphere (RL)</b>
<b>16</b>	<b>Apr 25</b> W	<b>Lecture: Farming Carbon (RL)</b>
	<b>Apr 27</b> M	<b>Presentation and Discussion: The Commoditization of Carbon (RL)</b>