

## Welcome

Welcome to Principles of Environmental Science! In this course, we position ourselves with our feet on the UW-Madison campus and ask questions about the energy we use to heat and cool our buildings, the food we eat, the air we breathe, the electricity we use to power lights and appliances, the goods we purchase, and the waste we create.

Ultimately, the goal of this course is to give you the tools to see the world around you in new ways, noticing things you may have missed and encouraging you to seek paths that both care for yourself and for all with whom you share this planet. This course truly is a blend of environmental studies and sciences - we use principles of chemistry, physics, and biology to understand our earth systems but we also explore societal issues like public health and social justice, and we do it all through the context of sustainability.

Through concrete, contextualized experiences (lab investigations and field trips), we'll make the invisible visible. Using the campus as a microcosm, you will encounter global environmental problems and solutions at the scale of our campus, which can then translate to the wider world.

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On campus, you will learn about sustainability-related initiatives, including those of the [Office of Sustainability](#), [the Wisconsin Union](#), and the [UW-Madison Division of Facilities Planning & Management](#) (FP&M for short). In non-COVID times, your laboratory would meet in the [Wisconsin Energy Institute](#) (WEI). This semester our lab meets in Grainger Hall to allow for social distancing but we still will highlight features of WEI to showcase sustainable building design on our campus.




Off campus, our lab activities will (virtually, sorry) travel to places in Madison that can help you see the bigger picture of energy, food, and waste. Some examples include the [Dane County Landfill](#) and the [Aldo Leopold Nature Center](#).

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This course rests on several core principles from environmental science, a multi-disciplinary field:

- We live on a finite planet.
- On this planet, our actions connect across space to neighbors near and far.
- Our actions also connect across time to past and future generations.
- Even though the connections may be difficult to perceive, they have profound implications and are worthy of our attention.

## Instructors

			
Name	Dr. Tim Lindstrom	Ms. Courtney Botelho	Ms. Audrey Stanton
Role	Lead Instructor	TA for Lab 301 and Lab 304	TA for Lab 302 and Lab 303
Email	timothy.lindstrom@wisc.edu	cbotelho@wisc.edu	apstanton@wisc.edu
Office hours	Right after lab, or email to schedule a virtual conference	Right after lab, or email to schedule a virtual conference	Right after lab, or email to schedule a virtual conference

## Logistics

[Link to this course in the UW-Madison Course Guide](#)

Course Name and Number: Principles of Environmental Science. Environmental Studies and Integrated Liberal Studies (ENVIR ST/ILS) 126.

Credits: 4

Course Designations and Attributes:

- Level: Elementary
- Breadth: Physical Sciences
- L&S Credit Type: C
- Lab 301/303: Honors

Course Description:

This course relates principles of environmental science to our daily activities, with an emphasis on sustainability, conservation, and systems thinking. It introduces science as a process of inquiry and discovery rather than a pre-established set of facts. Topics relate to energy, food, carbon, and waste, with sub-topics including water use, electric power, supply chains, buildings, transportation, land use, and social justice.

Prerequisites: None

Meeting Times:

- Lecture: Tuesdays and Thursdays
- Lab: Tuesdays 3:30pm-6:30pm (Sections 301 and 302) or Thursdays 3:30pm-6:30pm (Sections 303 and 304)

Meeting Location:

- Lecture: virtual and asynchronous (use Kaltura Gallery in navigation pane)
- Lab: 1100 [Grainger Hall](#)

Instructional Mode: virtual lectures and face-to-face labs

Canvas URL: <https://canvas.wisc.edu/courses/209541>

Textbook:

Title:	How Bad Are Bananas?: The Carbon Footprint of Everything
Author(s):	Mike Berners-Lee
Publisher:	Greystone Books (2011)
ISBN 10:	1553658310
ISBN 13:	9781553658313
Edition:	1st
PDF link:	<a href="https://epdf.pub/how-bad-are-bananas-the-carbon-footprint-of-everything.html">https://epdf.pub/how-bad-are-bananas-the-carbon-footprint-of-everything.html</a>

Credit Hours:

From the [UW-Madison Credit Hour Policy](#):

Traditional Carnegie definition of 1 credit hour is *"One hour of classroom or direct faculty/instructor instruction and a minimum of two hours of out of class student work each week over approximately 15 weeks, or an equivalent amount of engagement over a different number of weeks. This is the status quo and represents the traditional college credit format used for decades."*

<b>Weekly task</b>	<b>Hours / week</b>
<u>In class:</u>	
Attend lecture	2.5
Attend lab	3
<u>Out of class:</u>	
Prepare for and review lecture	1

Prepare for and review lab	1.5
Prepare for weekly SQQs	2

Non weekly task	Hours / semester
Prepare for 2 midterm exams and 1 final exam	16
Final exam take-home portion	12
Complete final exam	2

### Course Learning Outcomes

LO1: Identify drivers of climate change and describe effects both locally and globally

LO2: Employ a triple-bottom-line approach to assessing the sustainability of actions and processes

LO3: Analyze sustainability issues and/or practices using a systems-based approach

LO4: Explain the social, economic, and/or environmental dimensions of the sustainability challenges of operating a large public research institution

LO5: Use sustainability principles for developing personal goals and professional values

LO6: Connect the sustainability-related aspects of campus-based systems to local, national, and global contexts

LO7: Compare/contrast top-down versus bottom-up approaches to addressing sustainability-related issues on our campus and in the wider world

LO8: Value the human and natural capital necessary to sustain our life-support systems on this planet

### Course Unit Objectives

#### *Unit 1 - Energy & Sustainability*

UO1: Describe the basic elements of the UW-Madison campus energy infrastructure, including the operation of the Charter Street Heating and Cooling Plant

UO2: Express energy in terms of joules and kilowatt-hours

UO3: Contrast renewable and non-renewable fuel sources from the perspective of economic and environmental impacts

UO4: Describe initiatives that the physical plant have taken to reduce the energy footprint of the UW-Madison campus

UO5: Categorize different approaches that an individual or a campus can employ to reduce energy consumption

### *Unit 2 - Carbon Cycle & Air Quality*

UO1: Explain how a carbon footprint is both a metaphor and a shorthand

UO2: Compare and contrast major air pollutants and greenhouse gases, including their origins and their human and planetary effects

UO3: Use models of the global carbon cycle to describe major components, flows, and connections to global climate change

UO4: Describe the basic mechanisms that drive atmospheric warming

UO5: Develop a “carbon sense” for the climate change impact of various actions and processes

### *Unit 3 - Food & Supply Chains*

UO1: Identify the primary and secondary vendors that supply food to UW-Madison

UO2: Critique various approaches that can reduce the environmental impact of individual diets

UO3: Identify solutions throughout a food supply chain that can address issues related to food waste

UO4: Analyze a model of a campus food supply chain, identifying primary, secondary, and tertiary sources of greenhouse gases

UO5: Apply sustainability principles to assessing the impacts of our food systems

### *Unit 4 - Waste & Plastics*

UO1: Identify major waste streams at UW-Madison and the entities that manage them

UO2: Explain the relationship between plastics and hydrocarbons, utilizing the terms “monomer” and “polymer”

UO3: Classify types of plastic by their uses, physical properties, chemical properties, and recyclability

UO4: Outline responsible approaches to waste management that include recycling, composting, and reuse

UO5: Describe the idea of “responsible consumerism” in the context of addressing socio-environmental issues within the clothing/fashion industry

## Course Outline ([direct link to outline](#))

### COVID-19

This semester is unlike any other due to the COVID-19 pandemic. In an ordinary semester, we'd be meeting twice weekly as a class for lectures and exploring both the campus and our community through laboratory activities. Unfortunately, the current public health situation has resulted in moving to virtual lectures and has limited what we can do in lab (no tours and field trips, I'm afraid).

Above all, your physical and mental health take priority during this moment. Please take some time to review [UW-Madison's Smart Restart program for students](#) and don't hesitate to utilize the resources provided on our campus. Please consider your instructor and TAs as another resource if you need to reach out for any reason. We're good listeners and are happy to assist you in any way we're able, including helping you find additional campus resources if need be.

In Fall 2020, this course will operate in a hybrid format. Weekly lectures will be virtual and asynchronous, and lecture videos will be uploaded to the Kaltura Gallery on Tuesdays and Thursdays. If you need special provisions or accommodations regarding virtual lectures, please reach out to your instructor or TA.

Weekly labs will be held in-person (at least to begin the semester). Due to logistical constraints, we cannot simultaneously offer both in-person and virtual options for lab. We completely understand if attending in-person labs makes you anxious or uncomfortable in this moment, and if so we ask you to please consider taking the course another semester (it's offered every semester). To address potential areas of concern, here are the expectations we place on ourselves as instructors and you as students regarding labs this semester:

- We acknowledge that the health of students, staff, and our campus community is of utmost importance in this moment (there's a connection to sustainability here).
- Prior to every lab, your instructors will clean and sanitize all lab equipment and high-touch areas in our meeting space. We will repeat this process after the lab concludes.
- Public health comes first. If you are feeling any symptoms (fever, cough, chills, achy, etc.), then you should (1) stay home, (2) notify your instructors, and (3) contact [University Health Services](#). Unlike other semesters, lab attendance will not be tied to your final grade. There are more important things than a spotless attendance record.
- All students in this course will wear a facial covering at all times when inside the laboratory space. Thoroughly wash your hands every time you leave the laboratory space for any reason. These rules apply to your instructors, too.

- During lab, maintain social distancing to the best of your ability. You may need to be closer to other students at times to use equipment, but keep those moments brief and infrequent.
- Wipes, spray bottles, and hand sanitizer also will be provided in lab. Use them as you need them. We may also provide disposable gloves to use as you handle equipment.
- If you have to miss a lab for any reason, your instructors will work with you to make up any missed content. You will never be penalized for putting your health and the health of others first.
- Our goal is to meet in person for lab up through Thanksgiving, but if we must switch to virtual labs we'll do our best to make that transition in a way that minimizes the impact to your learning.

It goes without saying, but this semester we all need to be a bit more cautious and responsible with our behavior. Be judicious about what you do and who you interact with on and off campus, and let's all try to be gracious and understanding with each other in this time. Again, there are sustainability lessons to be found throughout this unique experience.

### UW-Madison Guidelines Concerning Face Coverings

Individuals are expected to wear a face covering while inside any university building. Face coverings must be [worn correctly](#) (i.e., covering both your mouth and nose) in the building if you are attending class in person. If any student is unable to wear a face-covering, an accommodation may be provided due to disability, medical condition, or other legitimate reason.

Students with disabilities or medical conditions who are unable to wear a face covering should contact the [McBurney Disability Resource Center](#) or their Access Consultant if they are already affiliated. Students requesting an accommodation unrelated to disability or medical condition, should contact the Dean of Students Office.

Students who choose not to wear a face covering may not attend in-person classes, unless they are approved for an accommodation or exemption. All other students not wearing a face covering will be asked to put one on or leave the classroom. Students who refuse to wear face coverings appropriately or adhere to other stated requirements will be reported to the [Office of Student Conduct and Community Standards](#) and will not be allowed to return to the classroom until they agree to comply with the face covering policy. An instructor may cancel or suspend a course in-person meeting if a person is in the classroom without an approved face covering in position over their nose and mouth and refuses to immediately comply.

### Quarantine or Isolation Due to COVID-19

Students should continually monitor themselves for COVID-19 [symptoms](#) and get [tested](#) for the virus if they have symptoms or have been in close contact with someone with COVID-19. Students should reach out to instructors as soon as possible if they become ill or need to isolate or quarantine in order to make alternate plans for how to proceed with the course. Students are strongly encouraged to communicate with their instructor concerning their illness and the anticipated extent of their absence from the course (either in-person or remote). The instructor will work with the student to provide alternative ways to complete the course work.

## Laboratory

We have assembled a set of weekly activities that will coordinate closely with what you learn in lecture. Most weeks, lab will last the full three hours.

Each week's laboratory activity will be submitted via Canvas by the following Thursday before midnight. You will be graded based on completion of the activity as well as the accuracy of your responses to several spot-graded questions. Each week's lab is worth 20 points.

Feel free to upload your lab report early. The penalty for late submission of a lab activity is 2.5 points. Anything after 11:59 pm on Thursday the week after the lab is late. You may still get partial credit for late submissions (TA discretion).

The questions in lab activities are fair game for assessments. No surprises! Questions from your lab manual will be taken word-for-word except for small changes in style to fit the format of an assessment.

Arriving to lab on time is important! We need everybody assembled to launch the activities of the day. If for some reason you know you will arrive late, please inform your TA as early as you're able. Normally, on-time arrival is worth 2.5 points (see Roll Call Attendance in Grades page). However, due to COVID uncertainties we won't tie the 2.5 points to your physical attendance in lab. Rather, you'll get the attendance points when you *upload* labs to Canvas.

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We typically do not offer make-up labs because of logistical difficulties. If for some reason you need to miss lab, please tell your TA at least 24 hours before your lab period. With enough lead time, you may be able to attend another section or make other arrangements.

Attendance in lab counts! If you miss 2 lab periods, the highest grade you can earn is a D. If you miss 3 or more labs, it is an F. This is a UW-Madison rule for physical science lab courses. Check the lab section for more details about lab. **These rules do not apply during COVID-19.**

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Safety counts! Each week, check the lab activity cover page carefully for any safety precautions. Also check the need for proper dress attire. Some field trips and lab activities require proper clothing and shoes (not relevant this semester).

Tim, Courtney, and Audrey take music requests in lab. We compiled an [ES126 2019 playlist available here on Spotify](#). The [ES126 2018 playlist is also public on Spotify](#). We'll use your responses from the Student Information Survey to make a 2020 playlist as well. Always feel free to send us artists or songs to add to the playlist.

[\(direct link to laboratory schedule\)](#)



## Grading

For specific points, due dates, and grading details for assignments, refer to the Grades or the Assignments pages. All assignments, quizzes, and exams are also listed in the Calendar.

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This course is set up to promote your success! For example, grades are assigned on a point scale. If you earn an A, you receive an A. This means that you are not competing with your classmates. Instead, we hope you will work together, enjoy each other's company, and perform well.

This course is set up to promote your success! As another example, your instructors will give you feedback via the sample quiz questions (SQQs) each week. The questions are pre-announced, so there are no surprises. You will get clear signals about what is important to know for assessments in this course.

This course is set up to promote your success! As one last example, your TAs are available each week in lab to answer your questions. Feel free to consult with them if you need help.

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Please keep in touch. During the semester, things unexpectedly may happen that will affect your ability to study. Let us know when problems arise, and we will work with you to find solutions.

## Assigning Final Grades

Your point total determines your grade. Some points, such as those for quizzes, are easier to obtain because the questions are pre-announced. Strive to get all of them! Same thing goes for lab activity points. Your instructor will assist you in lab to properly answer some questions in the write-up; others will be answered in lecture.

Exam points are harder to earn. Even so, most students perform quite well on them. Exam scores typically average around 80% (in contrast to quizzes for which the average is closer to 90%).

A	>92%
AB	90-92%
B	82-89.9%
BC	80-81.9%
C	70-79.9%
D	65-69.9% or missing 2 labs
F	<65% or missing 3 labs

## **Weekly SQQs**

### Why a weekly review assignment?

Sample quiz questions (SQQs) provide an incentive for you to keep up. Starting in the second full week of classes, SQQ sets will be posted to Canvas every Friday and each SQQ set is due to be uploaded to Canvas the following Tuesday by 11:59 pm. SQQ sets review the week's lecture content, should take between 30-60 minutes to complete, and will be spot-graded for 25 points each. As an example of "low stakes testing," the weekly SQQs will provide you with timely feedback and help you review/prepare for exams.

### Can you drop your lowest SQQ score?

Yes! Although we expect the SQQ grades to run high, you still may drop your lowest score. In return for this, we do not offer make-up opportunities except in specific circumstances. Please consult your TA regarding missing or making up a weekly SQQ assignment.

### Where to find help

Complete answer keys to the SQQs will not be posted, but the rubrics used to spot-grade the SQQs will have the answers posted to Canvas. If you have questions, seek help from your TA, consult your lecture materials, or work together with your classmates.

## **Exams**

### Timing and coverage

This course has two in-class (now virtual via Canvas) midterm exams worth 150 points, each covering material from the weeks that precede it.

Although these exams are not intended to be cumulative, some topics build upon those learned previously. Exams will be made available to access, take, and upload in Canvas. You will have a set period in which you can access an exam (usually a Mon-Fri window), and there will be a time limit (usually 90 minutes) that begins once you download the exam.

### Will previous year's exam help me?

Maybe to some extent, because the format of exams stays mostly the same year to year. But the content will vary. We will not provide copies of previous years' exams, but we will discuss the format and style of each exam thoroughly in lecture.

We recognize it's the 21st century and third-party websites host course content without the consent of the instructor (we see you Quizlet). Gone are the days of binders inherited through generations of students. So, previous students may have posted course content on such sites. We cannot condone or encourage the use of such sites as they are not instructor-approved content. Plus, the answers previous groups have posted can be incorrect. Trust us, we've looked.

### A minimum of trickiness

In writing exam questions, your instructors aim to be straightforward and to send clear signals about what you need to know. We do not intend to be tricky.

This said, it is nearly impossible to construct an exam that is 100% clear and fair. Even with our best efforts, a question or two will miss the mark, meaning that somebody will think that it is unfair or tricky. After each test, your instructors will inquire about any glitches and find ways to address them.

#### What if you need an early exam?

Consult with your TA at least a week before the exam (but the earlier the better). We'll work with you to arrange something.

#### Final Exam

The final exam is cumulative, worth 250 points, and designed to take 1.5 hours. You will have 2 hours to complete it in Canvas. If you have three exams scheduled in a 24-hour period, and if this exam is one of the three, please consult with your instructor at least 10 days before the exam for rescheduling.

#### Take-Home Activities

The end of the semester is usually a very busy time. To lessen that burden, we've taken 75 points of the Final Exam and re-allocated them for you. There are four activities, each worth 25 points. You will pick three of the four to do throughout the semester. These take-home activities are connected to the energy, food, and waste units of the course, and the due dates for each line up accordingly. Late submission of a take-home final will result in a 10-point deduction.

#### **Canvas Notifications**

You will receive notifications from Canvas to keep in touch with posted grades, feedback on your assignments, changes to course content, messages from your instructors, and messages from your peers.

To do so, you can follow this [handy-dandy guide](#).

A simple method: set all of your notifications to "Notify me right away" and enable "Push Notifications" for all categories. As the semester rolls on, if Canvas is bothering you too much with a certain type of notification, then feel free to modify the settings. This way, you won't miss out on important notifications early in the semester.

#### **Canvas Mobile App and Communication**

If you use a mobile device, you are expected to install the "Canvas Student By Instructure Inc." app. It is available for both [Android](#) and [iOS](#). Your instructors will do the same. This app, combined with the "Inbox" feature of Canvas and the correct notification settings, means you can message back-and-forth with your instructors and classmates from your mobile device. How neat is that!

If you don't use a mobile device, you won't miss out on content, just some conveniences.

Regardless, all course communications from your instructors could come through Canvas. If you communicate to your instructors via Canvas too, great. If you prefer email, that's fine too. Everything about the course will be contained within Canvas for you. If you feel the need to contact your instructors outside of Canvas, feel free to do so.

### **Electronic Lab Notebook**

You are expected to bring a charged laptop (or laptop with charger) to your lab session every week or bring a printed copy of the lab investigation. If you are unable or forget, there are two back-up options. Instructors will have some laptops you may borrow and/or a small number of printed copies.

Each week's lab investigation can be accessed via the *Lab Activities* tab in the navigation pane which links to a Google Drive folder of the lab handouts. You may download the file as a Word document or complete the handout as a Google doc online, but make sure to rename the file with your name so you have your own version.

During field trips, your instructors will provide printed copies of the lab activities so that you don't need to lug laptops around (not relevant during COVID).

If you print out the lab investigation, please turn in a PDF of it using [Office Lens](#) or [ScanBot](#) (both free, but ScanBot seems to handle multi-page documents better) or a [desktop scanner](#). Though we prefer electronic files, you may turn in a hard copy if all else fails.

You can check out laptops and tablets for free from [UW Info Labs](#).

### **Microsoft Office Suite**

The programs in this software suite are available to UW-Madison students for free on their personally-owned computers. [Installation instructions](#).

### **Rules, Rights, and Responsibilities**

[Link to the 2020-2021 UW-Madison Undergraduate Guide to your privacy rights, grievance rules, how to seek assistance, and responsibilities as a student.](#)

### **Academic Misconduct**

No form of academic misconduct will be tolerated. Any instances will result in failure of the quiz or exam, possibly failure of the course, and a letter placed in your file at the Office of the Dean of Students. Read the statement on [academic misconduct](#) from the Dean of Students.

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and

helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to the academic integrity link provided in the previous paragraph.

### **Accommodations for Students with Disabilities**

McBurney Disability Resource Center syllabus statement: *“The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life.*

*Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty, will work either directly with the student or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.”*

[Link to McBurney resources page.](#)

### **Diversity and Inclusion**

Institutional statement on diversity: *“Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.*

*The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.”*

[Link to UW-Madison diversity page.](#)