

BIO 331: Environmental Topics and Analysis

Spring 2026

Tuesday/Thursday, 9:55–11:40 AM, Flowe 312

Contact Information

Instructor: Dr. Mary Glover

Email: mmglover@peace.edu. Kindly allow 24 hours for a response.

Office: Pressley 100B (between 100 and 102)

Office hours: Thursdays, 11:45AM – 2:00PM or by appointment on Mondays and Wednesdays. Appointments can be made in Pacer Connect and linked [here](#).

Course description

Global environmental problems are complex and interrelated. This course provides the groundwork necessary to understand these interactions. Students investigate and analyze natural and human-influenced ecosystems, gather and analyze data, and gain a broader appreciation for the intersection of science, nature, and human society as it relates to environmental issues. The course will include field-based experiences depending upon the focus of the course in a given semester. Offered spring of even numbered years. Prerequisite: "C" or better in BIO 131.

Course topic

This semester, students will be exploring the water quality of streams in Raleigh. We will use water quality as a case study while working on data analysis and scientific writing learning objectives. Students will:

- 1) Evaluate and map water quality of streams in Raleigh using government datasets
- 2) Collect water quality measurements in a stream near to Peace University, including physical and chemical characteristics in the field and in the lab.
- 3) Present class findings at the WPU showcase on April 21.
- 4) Create a scientific poster to summarize their water quality research

Course learning objectives

By the end of the course, students can expect to:

Analyze data in R

- Manipulate data into a format that can be analyzed
- Calculate summary statistics
- Determine the best type of graph to display data and plot figures
- Test hypotheses with simple statistical tests
- Interpret results and form conclusions.

Communicate research and findings

- Communicate results to a scientific audience in written and spoken format
- Communicate results to broad, non-scientific audiences.
- Design a scientific presentation summarizing the overall class research project.

Evaluate water quality

- Describe human activities that impact water quality and evaluate human impact of waterways in Raleigh.
- Measure stream quality through physical, chemical, and biological metrics, using field and lab tests
- Interpret data to evaluate overall water quality in local streams.

Course resources

Textbook

There is no required textbook for this course. Resources and readings will be provided to students throughout the semester.

[R for Data Science](#) by Hadley Wickham is an excellent introduction and resource for using R software for data analysis. This is a free online textbook.

Technological requirements

In order to be successful in this class, students need access to a **personal computer with internet access**. Students will use the computer for data analysis in class. *A tablet will not work for this class.* If you do not, please contact Dr. Glover ASAP.

Course website

We will have a separate course website that will contain the class materials we will use in the course. This website simplifies the delivery of lessons and data for students. Website is linked here: <https://maryglover.github.io/bio331/>

R and Rstudio

R is a coding language (think python, C++, etc.) commonly used for data science, environmental science, and ecology. Students will use R and the software Rstudio, an interface for running R, to complete data analysis projects in class. We will complete coding exercises on the website, <https://posit.cloud/>. Students will receive instructions on how to access Posit Cloud during the first weeks of class. **Students should not purchase any Rstudio products.** You will be provided with what you need.

Moodle

Any resources that students need will be linked through WPU Moodle. Students will submit assignments in Moodle and grades will be continuously updated there.

Google

WPU provides a google account with your login where you can access your university email. We will use the google applications for:

- Data management: Data files will be shared using google drive.
- Presentation: Students will create a poster presentation using google slides.

We will also use **Google Chat** to communicate throughout the semester. This is helpful for:

- General communication between the instructor and students
- Sharing R code
- Collaboration and organization in group assignments

Students are encouraged to ask questions and to engage in the class google chat workspace. It will provide a simpler and quicker way to troubleshoot and share code during class data analysis activities. You will be invited to join the google chat workspace the first week of class. Once you have joined, you can access the workspace [here](#).

Course expectations

My philosophy for this course is that you, as students, are responsible for your learning, while I, as the instructor, am here to facilitate your learning.

What is expected of you, as a student?

- Attend each class session and to actively participate during class.
- Prepare for class by reading background materials and completing any coding assignments.
- Engage with your classmates in class discussion
- Spend the time needed to prepare for class and study outside of class time. College courses are designed to require 2-3 hours per credit hour of outside work. **This is a 4 credit class, so that is 8-12 hours of work each week!**
- Be respectful of classmates, especially in discussions when you have different ideas or points of view.
- Keep cell phones stored off of the student's desk unless they are being used at the request of the instructor.
- Take notes during class.
- Be curious! Part of learning is asking questions and taking initiative in finding answers to these questions.

- Ask questions. If you have concerns or questions about the course material or structure, you can email your instructor, post to the class chat, come to office hours, ask a classmate, etc.

What can you expect of me as your instructor?

- Provide necessary resources to facilitate your learning, including opportunities to practice problems, readings to help with comprehension of material, and links to class materials.
- Be available to answer questions before or after class, in office hours, and through email.
- Keep grades updated in Moodle. My goal is to have grades completed and in moodle 1 week after they are submitted
- Keep course assignments up to date in Moodle and inform students of assignment instructions and deadlines. All assignments will be in Moodle and I will email a summary to students each week.

In this class, you will be using computer programming to analyze environmental data. **Learning programming skills is a challenging task!** There will be times when you struggle and you will make mistakes. This is expected – your job is to keep trying and mine is to give you the resources you need to figure it out. Your mindset in this class will be very important for your success.

A large part of this class will be figuring out why you are getting errors in your code and what to do about it. When you do get errors, you should first double check that there are no misspellings or silly mistakes in your code. A single misplaced comma or misspelled word will cause your programming code not to work. Then, you can use online tools. Google will be your friend! Searching the error code can point you in the right direction.

In your searches, you will likely find some answers on [Stack Overflow](#). Stack Overflow is a very useful and approved source.

You will also likely notice that generative AI tools, like ChatGPT can also be used to write code. **You are not allowed to use AI in this course.** AI can sometimes be helpful, but it is not reliable. For AI to be useful, it requires that the user can accurately evaluate if the given results are correct. Therefore, AI use is not appropriate for students learning tools of data analysis, and is not allowed in this class. When you are working with data, it is crucial that you understand what your code is doing to get accurate, reliable, and ethical results.

Because data analysis and computer programming is challenging and you will run into roadblocks, it is important that you are completing assignments in advance so that you can reach out for help when needed.

Course components

Grade breakdown

Student grades will be calculated by using a percentage system. All grades will be recorded in Moodle including your current course grade.

Component	Percentage of grade
Data analysis exams (15% + 15%)	30%
Assignments (coding exercises and scientific writing)	25%
Field data collection	5%
Final poster presentation	25%
Showcase presentation	5%
Participation	10%
Total	100%

Grading scale: A: 90 – 100%, B: 80 – 89.9%, C: 70 – 79.9%, D: 60 – 69.9%, F: < 60%

Assignment re-grading must be requested through email within 5 days of receiving your grade. Please email Dr. Glover with justification for your re-grade.

Assignments (25%)

Coding exercises

Students will learn how to use the programming language R to analyze data. In class, we will go through different functions and examples, working together to make sure all students understand how to use the tools. Students will be given exercises for homework to practice the skills they learned in class. All coding assignments should be submitted in Moodle. **To receive credit for a coding assignment, students must submit all previous coding assignments.** This is crucial as each of the exercises will build on the previous ones. For example, in one of the first exercises, students will learn how to import data. You must master this skill before moving on to more complex skills. *All coding assignments must also be submitted before the exam where the skill will be assessed.*

Scientific writing

A large focus of this course will be reading scientific articles and scientific writing. Students will practice scientific writing throughout the semester during data analysis

projects both in and out of class. Students will practice a variety of scientific writing formats including informative essays for non-experts, scientific reports, infographics with figures, etc. Students will receive regular feedback on writing assignments from peers and instructors. In the beginning of the semester, students will create a shared google doc with Dr. Glover, where Dr. Glover has edit access. **Unless otherwise noted, all scientific writing assignments must be submitted using this single google document.** The process and editing is a very important part of scientific writing and will be assessed as a part of the assignments.

Data analysis exams (30%)

To assess data analysis skills, students will have two in class, open note, data analysis exams. In the exams, students will be given a dataset which they will analyze and answer questions about. With the data, students may be asked to plot, calculate summary statistics, and write conclusions.

Field data collection (5%)

As a part of the water quality data analysis, students will measure a variety of water quality metrics of a local stream in Meadow Brook Park, both in the field and with lab tests. Students are expected to carefully and accurately collect data, record measurements, and make observations. Students will then form conclusions and report results of water quality analysis in a written format.

We will have *three* class periods at Meadow Brook Park, conducting field work to evaluate the water quality of the Cemetery Branch stream. The park is 1.0 miles from campus ([google maps link](#)), accessible by Raleigh City bus, a 20 minute walk, or car. **Students will be responsible for their own transportation to the stream.** The schedule of dates at Meadow Brook Park will be provided with as much advance notice as possible, with possible delays for weather. Please contact Dr. Glover with any concerns regarding transportation.

Showcase presentation (5%)

Students will present a group presentation at the WPU Showcase on Tuesday, April 21. The time of the presentation will be announced closer to the date. Each student will be responsible for part of the presentation. We will work on this presentation in and out of class throughout the semester, to present to the WPU what you have learned about water quality here in Raleigh.

Poster presentation (25%)

Students will create a scientific poster summarizing their class project on the local water quality. The posters will consist of an introduction, methods, results, and

discussion section, utilize credible scientific sources, and include graphs of data collected in the course. Students will work on the poster throughout the semester and write drafts and edit the poster throughout the course. **Students will work together on the course project, but the poster must be completed *individually*, including all graphs and tables.** The poster must be completed in google slides.

Participation (10%)

Students are expected to be engaged and actively participate during class and will be graded accordingly. Much of the student learning will happen through participation in in-class activities, including data analysis and coding, graphing, data collection, peer reviews, and writing assignments.

Students will be graded on:

- Regular class attendance
- Contribution to class discussions and activities, both in class and in forums.
- Effective use of class time
- Completion of in-class activities

Course schedule

Key dates for the semester

Tuesday, January 20	Last Day to Add/Drop by 4PM
Tuesday, February 10	Exam 1
Tuesday, March 3	Exam 2
Thursday, March 5	Data Ethics Guest Speaker
Thursday, March 25	Last Day to Withdraw with "W"
Tuesday, March 31 and Thursday, April 2	Field work at Meadow Brook Park
Thursday, April 9	Field work quiz
Tuesday, April 21	WPU Showcase Presentation; Time TBD
Thursday, April 23	Field work at Meadow Brook Park
Friday, May 1	Final Student Presentations (during final exam time slot)

Below is a tentative schedule of topics and assignments for the semester. The schedule of topics will be a fluid document throughout the course to ensure that students have mastered course topics before moving on and to adjust for weather for field work. All changes will be communicated with students and students will receive assignment details at least one week in advance.

Week	Date	Topic	Assignment
1	Thur. Jan. 15	Data collection and experimental design	
2	Tues. Jan. 20	Using R programming for data analysis	<ul style="list-style-type: none"> - Make a Posit Cloud Account - Scientific method reading
		<i>Last day to add or Drop</i>	
	Thur. Jan. 22	Stream ecology	<ul style="list-style-type: none"> - Coding: Base R - Writing: Introduction sections
3	Tues. Jan. 27	Manipulating data Data management	- Writing: Method sections
	Thur. Jan. 29	Graphing	- Coding: Data manipulation project
4	Tues. Feb. 3	Dealing with data issues and missing data	<ul style="list-style-type: none"> - Writing: Graphing lies - Coding: Graphing - Figure captions (in class)
	Thur. Feb. 5	Review	- Poster: introduction draft
5	Tues. Feb. 10	Exam 1	
	Thur. Feb. 12	Summarizing data	- Writing: Results sections
6	Tues. Feb. 17	Joining multiple datasets	- Coding: Summaries
	Thur. Feb. 19	Statistics	- Coding: Joins project
7	Tues. Feb. 24	Water quality analysis	<ul style="list-style-type: none"> - Coding: Statistics - Writing: Discussion sections
	Thur. Feb. 26	Review	- Poster: water quality results and project planning
8	Tues. Mar. 3	Exam 2	
	Thur. Mar. 5	Data ethics guest speaker	- Questions for Dr. Read (in google chat)
9	Mar. 9-13	<i>Spring Break</i>	
10	Tues. Mar. 17	Spatial analysis	- Showcase: introduction slides

Week	Date	Topic	Assignment
	Thur. Mar. 19	Class project work	- Poster: methods part 1
11	Tues. Mar. 23	Class project work	- Coding: initial project code and questions
	Thur. Mar. 25	Project write up and discussions	- Coding: Final project code - Poster: Results and discussion outline (in class)
12	Tues. Mar. 31	Physical characteristics in the field	- Field work: pre-class quiz - Showcase: Slide assignment
	Thur. Apr. 2	Chemical Characteristics in the field	- Field work: pre-class quiz and lab notebook
13	Tues. Apr. 7	Chemical characteristics in the lab	- Field work: pre-class quiz and lab notebook
	Thur. Apr. 9	Field work conclusions Quiz on field work	- Poster: methods part 2 - Poster: results and discussion outline (in class)
14	Tues. Apr. 14	Showcase practice	- Showcase: slide assignment
	Thur. Apr. 16	Work day	- Showcase: Final draft
15	Tues. Apr. 21	<i>WPU Showcase; Our class will present! Time TBD</i>	
	Thur. Apr. 23	Macroinvertebrates	- Field work: pre-class quiz
16	Tues. Apr. 28	Peer review and work day	- Final poster rough draft
	Friday, May 1	Individual poster presentations during the exam time	

Course policies

Class guidelines and student expectations

Students are expected to attend each class session and to actively participate during class.

Attendance

Class attendance is necessary to be successful in this course as there will be material that is only available by attending class. Furthermore, *it is the student's responsibility to obtain class notes when absent.*

Students must be present for the majority of the class period (50 minutes) to be considered present. When possible, please contact Dr. Glover **prior** to a missed class via email, to ensure that you remain on track in the course. Written documentation of excused absence (i.e. illness, court appearance, school approved athletic event) must be submitted within 3 business days from the missed date of class.

Please be advised the University mandates that students attend 80% of the class meetings in order to pass the course.

For student athletes, it is the student's responsibility to communicate regarding approved absences (university sponsored events and competitions, but not practices) in a timely manner so that work can be completed *in advance*. Students will not be excused from assignments and will not receive extensions or make up exams unless discussed with the instructor at least *one week* in advance. Class attendance is necessary to be successful in this course. Many of the course assignments and activities will take place in class. Furthermore, *it is the student's responsibility to obtain class notes when absent*.

Late policy

Timely completion of assignments and activities is crucial for success in this course as tools and content will build on each other throughout the semester. For example, one week, we may learn how to import data into analysis software. This skill will be needed for all subsequent data activities. **Students are required to complete and submit previous data assignments before they can continue with class assignments.**

Assignments completed in class or in groups must be submitted on time to receive credit.

Due dates for assignments are provided on Moodle and on the course schedule. Students will also receive a reminder of assignments due before the start of the week. No assignments submitted after the last day of class will receive credit for a grade. *If a student consistently turns in class work late, they will be required to meet with the instructor to discuss.*

AI Statement

Students *may not* use artificial intelligence (AI) tools, such as ChatGPT, Gemini, Grammarly etc. When a student submits an assignment, they are representing the thoughts, ideas, and voice as their own. Text generated or edited with the use of AI does not reflect the student's own original work. Submitting assignments completed with the use of AI tools is considered plagiarism and will be treated as a violation of

the academic integrity policy. **Students will receive a zero on the work and the violation will be reported to the honor board.**

While the use of AI in certain contexts can be useful, it is most effective when you understand how it is being used and are able to critically evaluate the output. If you feel you are able to utilize AI tools to further your understanding in the course in a responsible and ethical way, you may discuss its use with the instructor *prior* to submitting an assignment. In addition, any use of AI tools must be properly cited, for example, see link for how to cite AI: <https://style.mla.org/citing-generative-ai/>.

Academic Integrity Statement

William Peace University seeks to develop both the intellect and character of its students. All members of the University are expected to promote a culture of academic integrity, and all students are expected to inform themselves of the University's policies and procedures related to Academic Integrity.

All forms of academic misconduct are violations of the University's Honor Code. These include, but are not limited to:

- Cheating: Using or attempting to use unauthorized materials, information, or study aids in academic work or in working with others on academic assignments, tests, or other requirements
- Facilitating academic dishonesty: Helping or attempting to help another student to commit an act of academic misconduct
- Falsification: Falsifying or inventing any information or citation in academic work
- Lying: Misrepresenting information that is relevant to the classroom or academic performance
- Plagiarism: Representing the words or ideas of another as one's own in any academic work, whether intentional or not.

If a faculty member suspects academic misconduct has taken place, the faculty member will forward the Academic Integrity Violation Report and all relevant evidence to the Academic Affairs designees and apply the agreed upon grade penalty if the student accepts responsibility. If the student does not accept responsibility, the University Academic Integrity Board is notified and an Academic Integrity Board Hearing is scheduled to determine whether it is more or less likely that the student has violated the academic integrity policy and whether the recommended outcomes should be applied.

Email etiquette

Please use polite email etiquette:

- A descriptive subject line
- A greeting (i.e. Hello Dr. Glover, Dear Professor, etc.)
- A description of your question in complete sentences with good grammar
- A sign off (i.e. sincerely, thank you, etc. and your name).

Disability Services

Disability Support Services are available to all Peace students who require reasonable accommodations due to any cognitive, physical, or psychological disability, in order to provide equal access to the educational environment. Students will need to be certified with Disability Support Services and provide appropriate documentation to receive an Academic Accommodation Plan. For more information or to become certified, please contact the Disability Support Services Coordinator by sending an email to disability@peace.edu.

Tutorial Services

Peer Tutoring is available for all Peace students free of charge. Support is offered in many subjects, including anthropology, biology, business, chemistry, criminal justice, history, math, political science, psychology, simulation and game design, and writing. Free workshops on study skills and documentation styles like MLA and APA are also offered each semester. Students can sign up for individual appointments using Pacer Connect or in person at the Center for Student Success, located on the 2nd floor of Finch Library. For more information, contact Will Christy, wachristy2@peace.edu.

NEED HELP? ADDITIONAL RESOURCES:

- For IT Issues, contact the IT Help Desk at helpdesk@peace.edu or 919.508.2417
- For on-campus counseling and support, please email Counseling@peace.edu
- For questions about your transcript, GPA, transferring-in classes from another institution, registration, etc., please contact the Registrar's office registrar@peace.edu
- To discuss career paths and internship, please contact Academic and Career Advising at Advising@peace.edu.
- For questions about library services and finding credible resources, please contact Mr. Nate Hellmers, Director of Library, NJHellmers@peace.edu
- For questions and support from Public Safety, please contact publicsafety@peace.edu or call the 24-hour hotline: 919-833-2277.