

# GEOL 1309/2309: Limnology Fall 2025



**Class Meeting Time:** Monday and Wednesday, 11:00 am to 12:15 pm

**Office Hours:** Monday through Thursday 9:00 AM – 10:00 AM

**Classroom:** B09 Thaw Hall

**Instructor:** Dr. Anusha Balangoda, SRCC 216, ANB287@pitt.edu

## Required Textbooks:

- ***Limnology: Lake and River Ecosystems, 3<sup>rd</sup> Edition by Robert Wetzel.*** You can purchase it in hard copy at the University bookstore or as a used, new, or e-book from multiple book vendors. I reserved a copy via course reserve.

### Library textbook reserve

Please follow the steps below to access it.

### Finding Course Reserve Materials

- Go to <http://library.pitt.edu>
  - Select the “Course Reserves” link located in the center of the page
  - In the PittCat Course Reserve search box, enter the name of the professor (Anusha Balangoda), the course name (GEOL 1309 Limnology), or the course number
  - Click on the title of the item that you wish to access
    - For e-books, click on the link under “Full-text availability.”
- Additionally, a free textbook is available, and you can download all chapters as a PDF via the link below.

### ***Limnology: Inland Water Ecosystems by Jacob Kalff***

<https://livresbioapp.files.wordpress.com/2016/03/limnology-kalff.pdf>

## Course Description and Objectives:

This course will examine the physical, chemical, and geological aspects of inland waters (lakes, reservoirs, rivers, springs, and wetlands). Specifically, the course will examine the origin and evolution of lakes, the physical and chemical properties of fresh and saline waters, watershed hydrology, and the biogeochemical cycling of major elements and nutrients. The course will also explore the impacts of human populations on aquatic systems, lake and reservoir management and restoration, and sediment records from lake sites.

Scheduled course meetings will consist of lectures addressing the fundamental processes of aquatic systems and discussion of assigned readings on using specific limnological procedures. The pace and depth of material covered will be determined by interest level and time needed for comprehensive treatment of all subject matter. Because the course is intended to be interactive, it is essential that you come to class prepared and with reading assignments completed.

### ***After completing the course, you should be able to:***

- Demonstrate basic principles in chemistry, physics, and biology of lakes and reservoirs
- Develop a general understanding of ecological communities of aquatic organisms
- Study how physical and chemical factors affect aquatic productivity
- Construct major elemental cycles and explain how they impact aquatic ecosystem structure and function
- Illustrate ways that humans alter landscapes and aquatic ecosystems
- Learn to critically read, with an understanding of salient points, original research articles related to freshwater ecology

**Graded Work:** Your grade is based on your independent work as described below.

- **Group Reading Assignments**, 3 points each, available via Perusall, 9 points total
  - a. Perusall Reading assignment 1
  - b. Perusall Reading assignment 2
  - c. Perusall Reading assignment 3
  
- **Limnology on the Media Presentations**, 6 points
  
- **Quizzes** – Timed, in-class, on paper (~25-30 min.), 12 points each, 48 points total
  - a. Physical Limnology- Quiz 1
  - b. Chemical Limnology- Quiz 2
  - c. Biological Limnology- Quiz 3
  - d. Emerging topics in Limnology- Quiz 4
  
- **Research Article Reports** – 5 points each, 15 points total
  - a. Research Article 1
  - b. Research Article 2
  - c. Research Article 3
  
- **Presentation on an Emerging Topic in Limnology**- 12 points total
  - a. Presentation topic and proposal- 4 points
  - b. Oral presentation- 8 points
  - c. **Paper (graduate students only\*) – 20 points**
  
- **Field and Laboratory Participation and Attendance.** Attendance will be taken on unannounced days throughout the semester- 10 points

**Total Possible points = 100 (undergraduate students)**

**120 (graduate students\*)**

**Grading Scale:**

90 -100 % = A

80 - 89 % = B

70 - 79 % = C

60-69 % = D

0- 59 % = F

**Policy on Late Work and Make-up Exams**

There are no make-up quizzes or work unless there are absolutely unavoidable circumstances and a written excuse is provided. Please contact me as soon as possible in the event of an unforeseen event to set up a time for a makeup quiz. Attendance for all lectures is required. It is your responsibility to contact me in a timely way for any absence.

**Graduate Participation and Assignments Expectations**

Graduate students are expected to go beyond the undergraduate level—think critically, lead class discussions, and connect course topics to their research. You will submit a well-cited, single-spaced paper on a Limnology-related topic (must align with your research) of your choice (due one week before the end of the semester) and deliver a 12–15-minute presentation during Emerging Topics Presentation Day to share your expertise and inspire your peers.

**Cell Phones**

Use of cell phones (this includes talking, texting, or internet) is not allowed in class. Before class starts, turn your phone off or put the ringer on silent and keep it out of sight.

**Commitment to Student Success**

We are committed to supporting every student's physical and mental well-being! We acknowledge that you may experience obstacles to your learning during the semester, which make it more difficult to succeed. We encourage students who are experiencing challenges to reach out to us, a trusted friend, a family member, and/or to campus resources for help as soon as possible. I have posted links on Canvas to some resources at Pitt or in Pittsburgh that you may find beneficial, and encourage students to let me know of any other resources.

## Be Curious, Be Respectful, Ask Questions

In this class, every person is responsible for creating a space that is intellectually rigorous and is a welcoming and inclusive environment where we are committed to learning from others, sharing equally in tasks, and respecting other perspectives. The diversity of perspectives and experiences each student brings to this class is viewed as a benefit and adds strength to the overall collaborative learning environment of the course. I expect you to treat fellow classmates with patience and respect. No harsh statements or demeaning or discriminatory behavior will be permitted. Participating in discussions, voicing your opinion, and having fun are encouraged.

## Contacting the Instructor

Please ask questions if you have them! I can't help you if I don't know you have questions. I encourage you to ask questions in or after the lecture in person. You can also contact me using your Pitt email or meet with me outside of class. Expect a response within one business day.

## Student Hours

As teachers, we enjoy interacting with students one-on-one and in the classroom. There are several reasons why you might want to meet with me. For example, you may wish to discuss a class topic in more detail than covered by the scope of the class or ask questions about material outside of class time. Meeting one-on-one with faculty is also a great way to develop potential references if you plan to apply for jobs, internships, or research experiences in the coming semesters.

## Tips for Success in Class

Do your best to maintain a healthy lifestyle this semester by eating well, exercising, getting enough sleep, and taking time to relax. ***Using your time to take care of yourself will help you achieve your academic goals more than spending too much time studying.***

- Make time at least *every other day* for course material and assignments outside of class.
- Check your Canvas notifications settings, ensuring that you receive course and assignment announcements on a device or email which you check often.
- Read assignment directions early so you can ask questions prior to deadlines.
- Be prepared to **apply your knowledge**; this requires both memorization (you need the right terms and facts to explain a concept) and **understanding and synthesis** (you need to review and compare material in different ways).
- Take notes as you read the textbook and watch lectures/videos.

Research shows that handwritten notes improve learning.

- Turn in assignments on time (each assignment has a due date, and late assignments will be accepted until one week after the due date without documented extenuating circumstances).
- Use each other as a resource for your learning: Clearly explaining a concept or a solution to someone else improves your understanding. I encourage group work on assignments and study groups to prepare for quizzes.
- **Study smarter, not harder.** Reflect on the quality of studying you are doing rather than the time you spend studying. Quizzing yourself or your classmates helps you retain knowledge much more than re-reading notes. Spend time studying topics you don't remember or you need to reinforce, not the ones you know already.

## Diversity and Inclusion

Students, faculty, and guests represent diverse perspectives, backgrounds, and experiences, which enrich our research and educational environment. Individuals of all races, colors, ancestries, genders, marital status, familial status, ages, backgrounds, beliefs, ethnicities, gender identities and expressions, national origins, religious or political affiliations, sexual orientations, abilities, and other visible and non-visible differences are welcomed in this class. I urge all to be mindful in this classroom and to feel responsible for creating a space that is intellectually rigorous and is a respectful, welcoming, and inclusive environment for everyone. No demeaning or discriminatory behavior will be permitted. If you feel uncomfortable, please feel free to approach me during or after class to discuss the situation.

In this class, we will have the chance to indicate the name that we prefer to be called and, if we choose, to identify the pronouns with which we would like to be addressed. Please approach me if you have such preferences, and I will do my best to address and refer to all students accordingly and support classmates in doing so as well. I will endeavor to use gender-inclusive and nondiscriminatory language in all course communication and materials. Your suggestions for how to improve the effectiveness of the course for you personally or other student groups are encouraged and appreciated. Our faculty is committed to communicating with students without judgment.

## Disability Resources

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services (DRS), 140 William Pitt Union, (412) 648-7890, [drsrecep@pitt.edu](mailto:drsrecep@pitt.edu), (412) 228-5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

## **Statement on the use of generative AI**

Intellectual integrity is vital to an academic community and for my fair evaluation of your work. All work completed and/or submitted in this course must be your own and completed in accordance with the University's Guidelines on Academic Integrity. You may not engage in unauthorized collaboration or make use of ChatGPT or any other generative AI applications at any time.

## **Academic Integrity**

Students suspected of violating the University of Pittsburgh Policy on Academic Integrity, noted below, will be required to participate in the outlined procedural process as initiated by the instructor. A minimum sanction of a zero score for the quiz, exam, or paper will be imposed. Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy.

Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators. To learn more about Academic Integrity, visit the Academic Integrity Guide for an overview of the topic. For hands-on practice, complete the Understanding and Avoiding Plagiarism tutorial.

## **E-mail Communication Policy**

Each student is issued a University e-mail address (username@pitt.edu) upon admittance. This e-mail address may be used by the University for official communication with students. Students are expected to read e-mail sent to this account on a regular basis. Failure to read and react to University communications in a timely manner does not absolve the student from knowing and complying with the content of the communications. The University provides an e-mail forwarding service that allows students to read their e-mail via other service providers (e.g., Hotmail, AOL, Yahoo). Students who choose to forward their e-mail from their pitt.edu address to another address do so at their own risk. If e-mail is lost as a result of forwarding, it does not absolve the student from responding to official communications sent to their University e-mail address. To forward e-mail sent to your University account, go to <http://accounts.pitt.edu>, log into your account, click on Edit Forwarding Addresses, and follow the instructions on the page. Be sure to log out of your account when you have finished. (For the full E-mail Communication Policy, go to [www.bc.pitt.edu/policies/policy/09/09-10-01.html](http://www.bc.pitt.edu/policies/policy/09/09-10-01.html).)

## Course Outline

- History of Limnology
- Structure of Aquatic Ecosystems
- Lakes and Reservoirs
- Streams
- Physical factors
- Water and light
- Fate of Heat and Water movements
- **Quiz 1-covers physical limnology**
- Productivity of Aquatic Ecosystems
- Inorganic Carbon
- pH
- Oxygen and salinity of Inland waters
- Field sampling techniques
- N and P cycles
- Iron, sulfur, and Silica cycles
- **Quiz 2- covers chemical Limnology**
- Plankton communities-Phytoplankton and Zooplankton
- Bacterioplankton, microflora, and sediments
- Field sampling techniques
- Eutrophication and acidification
- **Quiz 3- covers biological Limnology**
- Lab analysis techniques of chlorophyll a and phytoplankton
- **Quiz 4- Emerging topics in Limnology**

**Course Organization:** The lecture schedule is subject to change. I reserve the right to change the syllabus and class schedule. These changes will be announced in the lecture/Canvas.

Day	Date	Lecture Topic	Assigned readings
Mon	Aug 25	Course Orientation	Entire Syllabus
Wed	Aug 27	History of Limnology	Kalff Chp 2
<b>Mon</b>	<b>Sep 1</b>	<b>Labor Day - No Class</b>	
Wed	Sep 3	Origins and forms of lakes, reservoirs, and streams	Kalff Chp 6
Mon	Sep 8	Water as a substance	Wetzel Chp 2
Wed	Sep 10	Light in inland waters	Kalff Chp 10
Mon	Sep 15	Fate of Heat and Heat budgets	Wetzel Chp 6
Wed	Sep 17	Lake stratification	Kalff Chp 11
<b>Mon</b>	<b>Sep 22</b>	<b>Quiz 1 – Physical limnology</b>	
Wed	Sep 22 & 24	Productivity of aquatic ecosystems	Wetzel Chp 8
Mon	Sep 29	Dissolved oxygen	Wetzel Chp 9
Wed	Oct 1	<b>Field: Panther Hollow field monitoring techniques</b>	No readings
Mon	Oct 6	Salinity of inland waters, Iron and Silica cycles	Kalff Chp 13
Wed	Oct 8	Sulfur cycle, Inorganic C, and pH	Wetzel Chp 14
Mon	Oct 13	Nitrogen Cycling	Kalff Chp 14
Wed	Oct 15	Phosphorus Cycling	Kalff Chp 18
Mon	Oct 20	Phosphorus Cycling	Wetzel Chp 13
<b>Wed</b>	<b>Oct 22</b>	<b>Quiz 2- Chemical limnology</b>	
Mon	Oct 22 & 27	Planktonic communities: Phytoplankton	Wetzel Chp 15, sec. I
Wed	Oct 29	Phytoplankton growth characteristics	Wetzel Chp 15, sec IV
Mon	Nov 3	Phytoplankton primary productivity	Wetzel Chp 15, sec XIII
Wed	Nov 5	<b>Lab: Chlorophyll a analysis/ extractions</b>	No new readings
Mon	Nov 10	Planktonic communities: Zooplankton	Kalff Chp 23
Wed	Nov 12	Aquatic macrophytes adaptations	Wetzel Chp 17
Mon	Nov 17	Aquatic macroinvertebrates	Wetzel Chp 18
Wed	Nov 19	<b>Quiz 3</b>	Wetzel Chp 19
<b>Wed</b>	<b>Nov 19</b>	<b>Quiz 3- Biological limnology</b>	
<b>Nov 24 &amp; 26 Thanksgiving Break- No Class</b>			
Mon	Dec 1	Oral presentations (Emerging topics)	No readings
<b>Wed</b>	<b>Dec 3</b>	<b>Quiz 4- Emerging topics in Limnology: Last day of the class</b>	