

ENERGY BALANCE CLIMATOLOGY WINTER 2023

GEOG 409

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CLASS SCHEDULE

Section	Location	Time	Instructor(s)
GEOG 409 001 [SEM]	DWE 3517	Tuesdays 8:30 a.m. - 11:20 a.m.	Richard Petrone rich.petrone@uwaterloo.ca
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INSTRUCTOR / TA INFORMATION

Dr. Richard Petrone

Winter 2023

Office Location: EV1 223

Lectures: T 8:30 – 11:20

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DWE 3517

Email: rpetrone@uwaterloo.ca (mailto:rpetrone@uwaterloo.ca)

Office Hours: Wednesday 12:30 – 2:20

COURSE DESCRIPTION

Calendar Description for GEOG 409

A field and lecture course including the radiation and energy balances of various surfaces, the principles of turbulent energy exchange, and the biotic response to the energy environment. These concepts will be illustrated through the collection and examination of field data. The student will be responsible for presentation of a seminar on an assigned topic as well as presentation of the results of research incorporating data collected at the University of Waterloo weather station.

Prereq: GEOG 309

This course provides an introduction to the study of micrometeorology and physical climatology, examining the processes that underlie the behaviour of the atmosphere close to the surface. In Geography 409 the focus is on the energy exchanges within the planetary boundary layer of the atmosphere and other interfaces, such as that for plants and animals, as interest dictates. This will lead to an explanation of the microclimate variations within small places. This is one step in an understanding of the linkages between the atmosphere and the other components of the planet system. The balance of the energy exchanges within the boundary layer dictate the energy available for all other global processes.

The topics to be covered are:

1. The concept of an "Active Surface" and the relationship between energy balance and the microclimate.
2. Convective and conductive energy exchange - the flux profile relationships and the Bowen Ratio.
3. The energy and radiation balance of selected surfaces. (student seminars)

The objective of this course is to provide students with the background to further their interests in weather, climate and hydrology, and provide the theoretical foundations for further study in science and management courses.

LEARNING OUTCOMES

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

To identify the key boundary layer energy exchange processes that drive the hydroclimate system.

To gain experience with the tools and methodologies necessary to analyze hydrological, weather and climate information.

Understand the processes controlling the cycling of water between the surface and the atmosphere, and where it is stored in its three phases.

To identify and evaluate the characteristics of different land-use types and ecosystems that drive their hydroclimatic regimes.

TENTATIVE COURSE SCHEDULE

Jan. 10: Introduction and Concept of Energy Balance of an 'Active Surface'

Jan. 17: Active Surface

Jan. 24: Flux Profile Relationships

Jan. 31: Flux Profile Relationships

Feb. 7: Microclimate of Desert & Snow and Ice Environments tutorials by students

Feb. 14: Microclimate of Water Surfaces & Special Features of Vegetation tutorials by students (Quiz 1 – online Feb. 15)

Feb. 21: Reading week

Feb. 28: Plant Covers/Crops & Orchards/Forests tutorials by students (Quiz 2 – online Feb. 29)

March 7: Microclimate of Non-uniform Terrain (Patches & Topography) by students

March 14: Microclimate of Animals & Air Pollution tutorials by students (Quiz 3 – online March 15)

March 21: Intentionally Modified Climates tutorial by students / Research Paper Presentations (Quiz 4 – online March 22)

March 28: Microclimate of Urban Environments by students / Research Paper Presentations (Quiz 5 – online March 29)

TEXTS / MATERIALS

Title / Name	Notes / Comments	Required
BOUNDARY LAYER CLIMATES, T. R. Oke.	Available in Bookstore, online and on reserve at Porter Library.	Yes

Supplementary materials will be provided on LEARN as needed.

STUDENT ASSESSMENT

Component	Value
Student lecture	25
Student literature review	5
LEARN Quizzes on lecture and literature review by other students	25
Research Paper	30
Class participation	5
Research Paper Presentation	10

The student seminars covering the third topic are presentations by the students based upon a topic in the text. Past experience in this course shows that when students have prepared and taught a lecture, they have learned more and retained more than by studying the topic for a test, for example. With this seminar approach, the student will be teaching that topic to the rest of the class. I expect the presentations for each topic to be a minimum of 40 minutes, and using powerpoint slides. There will be 12 lecture topics to be chosen by groups of 2-3 students.

In addition, at the end of each seminar, the student will present a critical review of one current journal article relevant to that topic that will provide an update on the text material. This would typically be a few slides summarizing the objectives, approach, key results and conclusions of the article and one slide on your critical evaluation of the results. This may include an assessment of what you think the next steps might be, or an evaluation of how this research contributes to the larger picture of the field of study, or what the investigator may have done differently had the opportunity be available.

The student will submit the slide deck used for *both* the seminar and journal review as the written component of the assignment (no other written submission is required for this section). This submission will be due the day before the presentation. The seminar will be graded out of 25% and the review will be graded out of an additional 5%. These assignments will be determined for each student during the third week of class (class time on January 24) by a signup on-line. Depending on class numbers it is possible that there may be more than 1 student per topic, depending on course numbers, each agreeing to address a specific sub-topic. The slide decks will be posted in the class section on 'Learn'.

Based on lectures, 5 Quizzes will be done on LEARN as 5 question quizzes. These will test the rest of the class that will assess what has been presented in the literature review and journal review. Each correct answer is worth 1 mark and therefore each test is worth 5 marks. For each student, 25% of the final grade is allotted to these tests. Quizzes will occur approximately every other week, but please consult the schedule for weeks with Quizzes. All quizzes will be done on LEARN, with the weekly quizzes opening Wednesday at noon and closing Friday at midnight. You will not receive your grade for the week's quiz until that quiz is closed on Monday night.

A research paper completed in pairs of students will be graded out of 30% of the final mark. It will be due electronically on LEARN by 4:30 on April 7 (Friday of the last full week of classes). This paper may be a critical evaluation of a research project discussed in the literature. It may also be an analysis of a set of data collected by the student, or abstracted from the literature. It could focus on the development and testing of an instrument or field experiment. The topic should be cleared before you start to ensure that it is manageable within the time and space limitations. A one page summary with an additional proposed bibliography is to be submitted by each team in the fourth week (class time on January 31). The paper will be approximately 12 – 15 pages in length, double spaced. To repeat, the final submission date for the complete paper is April 7 (Friday of the last full week of classes).

It is possible to present group research papers (i.e. more than a pair of students). In this case, I will need a signed statement from each individual, all on one page appended to the one-page summary submitted during class time on January 31, stipulating that the final mark will be assigned equally to all members of the group.

Presentations of research papers will be made in the last week(s) of class (see schedule), when students will present 15 minute summaries of their research papers. Presentations are expected to highlight the objectives of the research paper as well as a synthesis of your main findings/results and conclusions. Presentations are expected to be done in PowerPoint or a similar platform, and will not exceed 15 minutes in length. Following the 15 minute presentation there will be 5 minutes for questions and class discussion. The presenters are expected to provide a stimulus for class discussion in their presentation.

Note that a late penalty of 5% of the course mark will be applied for every three working days the seminar overheads **or** the paper is submitted after the due date.

ASSIGNMENT SCREENING

No assignment screening will be used in this course.

ADMINISTRATIVE POLICY

Late Submission: Failure to submit your work on time will result in a grade of 5% per business day beyond the due date for that assignment. Late work will not be accepted under any circumstances without official documentation; for example, a University Illness verification form.

Illness During Term: Please refer to the University of Waterloo Policies regarding documentation and the management of requests for accommodation due to illness during the term. Illness verification forms are required for any student seeking accommodation for any course requirement missed due to an illness. Please refer to http://www.registrar.uwaterloo.ca/students/accom_illness.html for more information.

Policy on Regrading Assignments: If you notice an error in the assessment of your work please follow these steps:

1. Wait 48 hours after the assignment was returned before requesting a regrade.
2. All regrade requests must be submitted in hard-copy to the instructor, describing the errors you believe were made. Verbal or emailed requests will not be accepted. Be as specific as possible and list all relevant details, e.g., “my marks were summed incorrectly for questions 1–5”.
3. If another student’s assignment is used as an example or reason for an error in grading, both assignments must be submitted for a regrade.
4. The entire assignment will be regraded, not just the errors indicated in the written request. The resulting grade may increase or decrease depending on the result of the regrading.

Policy on Email Correspondence: Students are encouraged to attend office hours to discuss any issues relating to the course. On the other hand, students should rarely need to send email to the instructor or TA because most information required is available elsewhere: e.g., in this course outline, on UW LEARN, on the Discussion boards, in the textbook, after class, or at office hours. However, if your question or concern cannot wait until the next lecture then please remember these policies when sending email:

- Always send emails from your University of Waterloo email account.
- All emails should have the following subject line: “GEOG209: <<insert your message here>>”
- If your email includes an attachment, describe the contents of the attachment in the email. Be polite, respectful and professional.
- Proofread your email and use correct grammar and punctuation.
- Always use an appropriate greeting, and sign your full name.
- Allow the instructor or TA at least two business days to respond before sending the request again. Mark all urgent matters “URGENT” in the subject line.
- The instructor or TA reserves the right to reply to you along with the entire class if the question is deemed to be relevant to other students on the course.

Unclaimed assignments: Assignments that are not picked up by students must be retained for one year after last use (i.e., after the end of the term in which the work was submitted or after the resolution of any grade revision request or appeal), unless students are notified that they will be retained for a shorter period of time. Instructors who do not wish to retain unclaimed assignments for one year may dispose of them sooner provided they include notification of this practice on the course outline.

Unclaimed assignments will be retained until one month after term grades become official in quest. After that time, they will be destroyed in compliance with UW’s confidential shredding procedures.

Mental Health: The University of Waterloo, the Faculty of Environment and our Departments/Schools consider students’ well-being to be extremely important. We recognize that throughout the term students may face health challenges - physical and / or emotional. **Please note that help is available.** Mental health is a serious issue for everyone and can affect your ability to do your best work. Counselling Services (<https://uwaterloo.ca/campus-wellness/>) is an inclusive, non-judgmental, and confidential space for anyone to seek support. They offer confidential counselling for a variety of areas including anxiety, stress management, depression, grief, substance use, sexuality, relationship issues, and much more.

All students are encouraged to download the WatSAFE app which is available free through the google and iOS app stores. The WatSAFE app provides on- and off-campus contacts for students in distress, including international students, and other information related to campus safety and security.

Religious Observances: Students need to inform the instructor at the beginning of term if special accommodation needs to be made for religious observances that are not otherwise accounted for in the scheduling of classes and assignments.

Communications with Instructor and Teaching Assistants: All communication with students must be through either the student's University of Waterloo email account or via LEARN. If a student emails the instructor or TA from a personal account they will be requested to resend the email using their personal University of Waterloo email account.

Recording lecture: Use of recording devices during lectures is only allowed with explicit permission of the instructor of the course. If allowed, video recordings may only include images of the instructor and not fellow classmates. Posting of videos or links to the video to any website, including but not limited to social media sites such as: facebook, twitter, etc., is strictly prohibited.

UNIVERSITY POLICY

Academic integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check [the Office of Academic Integrity](https://uwaterloo.ca/academic-integrity/) (<https://uwaterloo.ca/academic-integrity/>) for more information.]

Grievance: A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70>) . When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for their actions. [Check [the Office of Academic Integrity](https://uwaterloo.ca/academic-integrity/) (<https://uwaterloo.ca/academic-integrity/>) for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to [Policy 71, Student Discipline](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71>) . For typical penalties, check [Guidelines for the Assessment of Penalties](https://uwaterloo.ca/secretariat/guidelines/guidelines-assessment-penalties) (<https://uwaterloo.ca/secretariat/guidelines/guidelines-assessment-penalties>) .

Appeals: A decision made or penalty imposed under [Policy 70, Student Petitions and Grievances](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70>) (other than a petition) or [Policy 71, Student Discipline](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71>) may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to [Policy 72, Student Appeals](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72>) .

Note for students with disabilities: [AccessAbility Services](https://uwaterloo.ca/disability-services/) (<https://uwaterloo.ca/disability-services/>) , located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Turnitin.com: Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course.

It is the responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit alternate assignment.