

University of Waterloo
Department of Geography and Environmental Management

GEOGRAPHY 209
HYDROCLIMATOLOGY

Ms. Natasa Popovic
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Spring 2019
Office Location: EV1 235
Phone:

Lectures: Mon 10:30 am – 12:20 pm
PAS 2083

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Office Hours: TBD

Labs: Tuesday 2:00-2:50; 3:00-3:50; 4:00-4:50, 7:00-7:50
EV1 240

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INTRODUCTION

This course provides students with a thorough background of the fundamental processes governing the climate and hydrological systems, and the links between them. The course first reviews fundamental atmospheric and hydrologic processes, and traces the flow of energy and water between the Earth's surface and the atmosphere. Then the physical processes controlling the water cycle are examined, including evapotranspiration, precipitation, runoff and water storage in the natural reservoirs (including soil and groundwater, lakes and wetlands). Finally, students will learn about the roles of water in climate in the Earth's main biomes.

Through the use of group activities students will be given the opportunity to gain experience manipulating real hydrological and meteorological data and instrumentation. This course will serve as an introduction to near-surface hydroclimatic processes, their feedbacks and climate change, forming essential background for upper level courses in climate change, hydroclimatology and environmental sciences and studies in general. The fundamental knowledge and skills developed in this course will provide students with the basis to appreciate and understand the natural hydrologic and climate systems. It also provides the required foundation for advanced courses in climatology and hydrology.

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

COURSE OBJECTIVES

1. To identify the key boundary layer processes that drive the hydroclimate system.
2. To gain experience with the tools and methodologies necessary to analyze hydrological, weather and climate information.
3. Understand the processes controlling the cycling of water between the surface and the atmosphere, and where it is stored in its three phases. ^[L]_[SEP]
4. To identify and evaluate the characteristics of different land-use types and ecosystems that drive their hydroclimatic regimes.

LECTURE TOPICS

1. Introduction to Hydroclimatology
2. Hydrological Cycle, Water Balance Equation
3. Catchment Hydrology
4. Soil Water and Infiltration
5. Precipitation
6. Evapotranspiration
7. Boundary Layer Exchange Processes
8. Climates of Natural Surfaces and Vegetation Effects
9. Deserts and Snow
10. Water
11. Ecology – Hydroclimate Linkages – Water and Carbon Exchange
12. Landuse Change and Hydroclimatic Effects
13. SVAT modelling

COURSE MATERIALS

Course Text:

“Hydroclimatology: Perspectives and Applications”, M.L. Shelton, Cambridge, 2009.
[freely available via UW library website. Hard copies available at UW Bookstore, online retailers and used from various sources.]

Additional material for specific topics will be available on reserve in the library.

Other Useful Texts:

Oke, T. R. (1987). *Boundary Layer Climates* (2nd ed.). Taylor & Francis.

Dingman, S.L. (2015) *Physical Hydrology* (3rd ed.) Waveland Press.

COURSE TIMETABLE

The course will be comprised of approximately 12-13 lectures and 11 tutorials/labs that will be led by the course TAs. Tutorial/lab sessions will run every week according to the following schedule. Tutorial rooms and groups will be determined in the first week of lectures.

Lecture Schedule

May 6	Lecture
May 13	Lecture
May 20	Victoria Day (No Lecture)
May 27	Lecture
June 3	Lecture
June 10	Lecture
June 17	Lecture
June 24	Lecture
July 1	Canada Day (No Lecture)
July 2	Lecture (Make up for Canada Day)
July 8	Lecture
July 15	Lecture
July 22	Lecture
July 29	Lecture (Make up for Victoria Day)

Tutorial / Lab Schedule

May 7	Lab #1 – Water Balance & Statistics assignment introduced along with tutorial on spreadsheet use.
May 14	Lab #1 – work on with TA
May 21	Lab #1 – work on with TA
May 28	Lab #2 – Streamflow & Climate assignment introduced & Lab #1 handed in
June 4	Lab #2 – work on with TA
June 11	Lab #2 – work on with TA
June 18	Lab #2 – work on with TA
June 25	Lab #3 Energy Balance & Evapotranspiration assignment introduced and Lab #2 handed in
July 2	No lab (Monday Schedule, Attend Lecture this day)
July 9	Lab #3 – work on with TA

July 16 Lab #3 – work on with TA
July 23 Lab #3 – work on with TA and hand in Lab #3
July 30 Lab Final Exam Review (Make up for Canada Day reschedule)

*****Note that there will be a field component where you will be responsible for collecting data for your laboratory assignments. Failure to attend (without documentation) will result in marks off of your assignment. Field details will be better explained in class and during lab time.**

STUDENT RESPONSIBILITIES

1. To attend lectures and go through assigned readings.
2. Term work: To attend and participate in tutorials/lab sessions and complete lab assignments.
3. Final Examination – This will be based on the lectures and any assigned readings. Your final examination will be written during the official exam period at a location determined by the registrar.

GRADES

Lab Assignments (20% x 3)	60%
Final Exam	40%

PLEASE NOTE

LATE SUBMISSION: Failure to submit your work on time will result in a grade of 5% per 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.

MISSED FINAL EXAMINATIONS: If the final exam is missed due to illness and all of the proper documentation is submitted on time, either a statistical grade adjustment will

be made, or a makeup exam or a deferred final examination (i.e., the next time that this course is taught) will be written.

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 the 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. [SEP]
- 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. [SEP]

UW Policies [SEP]

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 www.uwaterloo.ca/academicintegrity/ for more information.] [SEP]

Discipline: A student is expected to know what constitutes academic integrity [check www.uwaterloo.ca/academicintegrity/] to avoid committing an academic offence, and to take responsibility for his/her actions. 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, www.adm.uwaterloo.ca/infosec/Policies/policy71.htm. For typical penalties check Guidelines for the Assessment of Penalties, www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm. ^[SEP]

Appeals: A decision made or penalty imposed under Policy 70 (Student Petitions and Grievances) (other than a petition) or Policy 71 (Student Discipline) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 (Student Appeals) www.adm.uwaterloo.ca/infosec/Policies/policy72.htm.

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4, www.adm.uwaterloo.ca/infosec/Policies/policy70.htm. When in doubt please be certain to contact the department’s administrative assistant who will provide further assistance.

Consequences of Academic Offences: ENV students are strongly encouraged to review the material provided by the university’s Academic Integrity office (see: <http://uwaterloo.ca/academicintegrity/Students/index.html>).