

University of Toronto Scarborough

“PRINCIPLES OF HYDROLOGY”

(EES B04H3F, Fall 2023)

Professor:	C.P.J. Mitchell (he/him) Office: EV-450	Email: carl.mitchell@utoronto.ca
Lecture Time:	Wednesdays, 1-3 pm in HL-B101 (in person)	
Office Hours:	Thursdays, 2-3 pm (no appointment necessary) and via Zoom or Teams by request	
Course Web Site:	Everything on Quercus (https://q.utoronto.ca)	
Teaching Assistants:	Aisha Javed (aisha.javed@mail.utoronto.ca) Planck Huang (planck.huang@utoronto.ca) Sarah Gigi (sarah.gigi@mail.utoronto.ca)	
Practical Times:	Tut01: Thursdays, 11 am-1 pm, IC120 Tut02: Wednesdays, 3-5 pm, HW408 Tut03: Thursdays, 9-11 am, HW308 Tut04: Wednesdays, 9-11 am, MW120 Tut05: Wednesdays, 9-11 am, AA205	
Text:	"Fundamentals of Hydrology, Third Edition" [Author: Tim Davie; Publisher: Routledge]	

INTENT OF THE COURSE

Hydrology is the study of the occurrence, circulation, and distribution of water on Earth and in its atmosphere. This course is intended to be a comprehensive introduction to how water moves through terrestrial systems, both “naturally” and as a result of human alteration of the environment. Simply put, water is the source of life. When NASA goes looking for life on other planets, what is the first thing they look for? Water! Water is also a powerful buffer for energy - that is it takes very large amounts of energy either to heat water up or to evaporate it. How much water is stored at the surface therefore strongly affects the temperature of the surface, the temperature of the air above it and its behaviour. After introducing some of the fundamental concepts in hydrology, considerable focus will be placed on the interaction between water on the surface and water in the atmosphere. Given concerns about global climate change, these surface-atmosphere interactions are of crucial importance. The hydrology of a system determines not only the temperature of the air above it, but also how much water vapour gets into the airmass by evaporation. This is another enormously important control on climate and rainfall.

Water is also an important vector for the transport of mass and energy (nutrients, toxins, pollutants, etc.) from place to place in the environment. Pollutants may be transported about via rainfall, streamflow, and seepage through the ground. For example, if you want to know what nitrate (NO_3^-), a major fertilizer, is doing in an agricultural system, first you have to know how the water in which the nitrate is in solution is moving through the system. The knowledge of water motion is a prerequisite for knowing where a solute is, how much is there, where it is moving to, and at what rate.

Hydrologic systems are complex and difficult to understand and model, and yet are critical in any sort of understanding of natural system processes at any scale. To understand hydrology, we have to make measurements. To make measurements we have to have some information about how the system works, where and how to make measurements and what those measurements mean. This course is about the fundamentals of how hydrologic systems work, how we can understand them better and how we can use that better understanding to make predictions of hydrologic system behaviour.

ASSESSMENT IN THE COURSE

Six online quizzes (via Quercus) worth 4% each	24%
Four assignments worth 10% each	40%
Tutorial attendance and participation	6%
FINAL EXAM	30%

LECTURE FORMAT AND QUIZZES

This course is designed around a modified “flipped classroom”. Several pre-recorded “mini lectures” will be provided to you ahead of physically meeting for the in-person class. **The intention is that you will watch the videos for a particular week ahead of attending the lecture every Wednesday at 1 pm.** The weekly in-person lecture will then be devoted to a rather quick overview of the mini lectures and an overall less structured format. Specifically, the in-person lectures will be less scripted and used to have open discussions about the material, to go deeper into some of the more complicated subject matter (as identified by you), to work through example problem sets together, and to discuss answers to quizzes from time to time. In my opinion, it is imperative that you make all attempts to attend the in-person lecture each week. I can tell you from experience that students’ grades tend to be directly related to their level of engagement with the course, particularly lectures and discussions therein.

To ensure that you are keeping up with course material, there will be **online quizzes you need to complete every two weeks.** Because of the online quizzes, there is no midterm exam for the course, but there *is* still a Final Exam. Online quizzes must be completed within 48 hours of the end of the lecture where each quiz is assigned. All of the days by which you need to complete quizzes and the material related to quizzes, is available in a schedule at the end of this syllabus. The quizzes will have 10 multiple choice questions each, will be completed online, and will involve just one timed (15 minute) attempt per student. Quizzes will be administered through Quercus. Outside of extraordinary circumstances (e.g., accommodations, accidents and other events beyond your control) and because we will go over answers regularly, missed quizzes cannot be made up.

6% of your overall grade will be given in relation to your attendance at and participation in tutorials because it is imperative that you attend tutorials to be able to complete your assignments. Assignments are related to material taught in lectures, but not entirely because tutorials go into greater depth and introduce specific skills needed to complete the assignments.

ASSIGNMENTS/TUTORIALS

You will have 4 assignments during the term, worth 10% each (40% overall of the final grade). The idea of the assignments is to teach you some practical hydrological skills, and introduce you to some of the common instrumentation and techniques used by hydrologists. The assignments will all include having to use spreadsheets/Excel a lot, but we will provide some specific training to make sure you learn how to use them efficiently, if you do not know already. You will be given assignments via Quercus and you must submit your assignments for grading via Quercus. You are fully expected to attend tutorials (in-person; see schedule second last page of syllabus), where TAs will instruct you on how to complete the work and accompanying problem sets. You will notice that all assignments are due by 10 am (submitted via Quercus) the day of your next tutorial, except for assignment #4, which is due (submitted online) by midnight the day of the *second last* lecture of the year. I highly recommend you attend all tutorials otherwise completing your assignments will be overly difficult and indeed some of your final grade is related to this attendance and participation. This includes “tutorial #0”, which is an overview of basic math skills needed for the course and is crucial for getting information: please attend!

In completing your assignments, you should use a word processor for your written responses in your assignments. Where it is otherwise difficult to do so (calculations, sketches), you may handwrite these, take a photo of it and add it into your document in the appropriate spot. If you have graphs or tables to present in an assignment, either paste them into your word processor document where the question is being answered or refer to their place very specifically in an appendix. Your document should conform to the following: 25.4 mm margins, single-spaced, 12-point print size. The document must have your name, date and student number. Since these assignments are submitted online, add a title page or not; it won’t affect your grade.

COURSE TEXT

“Fundamentals of Hydrology, Third Edition” by Tim Davie, available through the UofT Bookstore and online. “Fundamentals of Hydrology” is a relatively basic/straightforward hydrology textbook that focuses on broad understanding, and I think is good for students’ introduction to hydrology. As far as textbooks go, it is relatively inexpensive. This book will provide a good background for course material but I don’t follow the textbook exceptionally closely for my lectures – the book is meant to supplement your understanding. **As far as your**

evaluation in this course goes (i.e., quizzes and exam), assigned readings and all lecture material (even just what I say in addition to what is written on slides) are fair game. I *will* lean a bit more on lecture material than readings for quizzes, but I wouldn't ignore the readings by any means.

MISSED TESTS/LATE PENALTIES FOR PRACTICALS

You have 48 hours to complete each quiz on your own time. Due to the nature of online delivery, quizzes cannot be repeated and quizzes you do not complete by the deadline will be given a grade of zero (outside of extraordinary circumstances). This is because we will discuss quiz answers in the subsequent lecture. The only automatic exception is if there is a technical/Quercus error that is because of me or the university.

Fundamentally, I feel that late assignments are also entirely unacceptable. However, knowing that things do happen, my policy is that late assignments will be penalized at a rate of 10%/day and assignments more than two days late will simply not be accepted. In short, **if you are MORE than two days late, you will get a zero on the assignment**. If you fail to hand in your assignment on time (again, by 10 am), you will be assessed a late penalty. For students with necessary accommodations, I will work with you personally to make sure you are able to complete your assignments in a timely manner, even if it is outside of these instructions.

INTERACTION WITH THE PROFESSOR AND TEACHING ASSISTANTS

I prefer to be referred to as Professor Mitchell (he/him).

The University of Toronto is committed to equity, human rights and respect for diversity. I am highly in support of the Scarborough campus' core mission of Inclusive Excellence. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.

In addition to my office hours, I will usually stick around the lecture or lecture hallway for a bit longer if students want to chat about hydrology or other things related to the course/school. Your TA(s) will also have office hours (look for this to be added to the Quercus page) and you should take advantage of these for questions pertaining to your laboratory assignments. Your TA is not responsible for knowing lecture material inside out, so if you have questions regarding lecture material, you are best to talk to Professor Mitchell. Neither Professor Mitchell nor the TA(s), however, will answer point-blank questions about specific questions on assignments ahead of them being due. We WILL help you to better figure it out on your own though.

Email policy: Email should be restricted to only times when personal information is necessary to share (something happened to you, your grades, etc). All questions related to course content should otherwise be directed to Quercus as a Quercus Discussion so that the entire class may benefit from the answer. All emails should be sent via a ".utoronto.ca" email address. Emails from other domains will likely be lost to spam filters and not responded to. **I can only guarantee email responses within about 48 hours after receiving them, though I attempt to be quicker than that whenever I am able.**

QUERCUS INFORMATION

Logging in to your Quercus Course Website

EESB04 uses Quercus for its course website, which can be accessed via <https://q.utoronto.ca>.

Activating your UTORid and Password

If you need information on how to activate your UTORid and set your password for the first time, please go to <http://www.utorid.utoronto.ca>. Under the "First Time Users" area, click on "activate your UTORid" (if you are new to the university) or "create your UTORid" (if you are a returning student), then follow the instructions. If you have any issues, please contact the Student Help Desk at 416-978-HELP.

Communication from Professor Mitchell and TAs

If I need to contact you about an important change in the course, I will do so via the Quercus system. I suggest you consider downloading the "Canvas Student" app to your device(s) or **at a minimum, ensure your utoronto email address is properly linked for forwarding to whatever email service you actually check.**

You are responsible for:

1. Ensuring you have a valid UofT email address that is properly entered in the ROSI/ACORN system
2. Checking your UofT email account and/or Quercus communications on a regular basis as this is the primary means of professor-to-student communication outside of regular classroom hours.

ACCESSIBILITY STATEMENT

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. If you require accommodations, please share your accommodations letter with me as soon as possible at the start of the term. I will work with you and AccessAbility Services to ensure you can achieve your learning goals in this course. I will treat all personal conversations about students accessibility concerns as confidential. The UTSC AccessAbility Services staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. (416) 287-7560 or ability@utsc.utoronto.ca.

STUDENT CODE OF CONDUCT

The University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences in papers and assignments include using someone else's ideas or words without appropriate acknowledgement, submitting your own work in more than one course without the permission of the instructor, making up sources or facts, obtaining or providing unauthorized assistance on any assignment.

On tests and exams cheating includes using or possessing unauthorized aids, looking at someone else's answers during an exam or test, misrepresenting your identity, or falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes. That said, I do not require doctor's notes for anything related to this class.

RELIGIOUS ACCOMMODATIONS

The University has a commitment concerning accommodation for religious observances. I will make every reasonable effort to avoid scheduling tests, examinations, or other compulsory activities on religious holy days not captured by statutory holidays. According to University Policy, if you anticipate being absent from class or missing a major course activity (like a test, or in-class assignment) due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two to three weeks), so that we can work together to make alternate arrangements.

COURSE MATERIALS AND COPYRIGHT

Course materials are provided for the exclusive use of enrolled students and both I and the University of Toronto own the copyright to all of my lecture, test and assignment materials. Do not share them with others. Posting my material on the Internet is prohibited. I do not want to discover that a student has put any of my materials into the public domain, has sold my materials, or has given my materials to a person or company, especially one that is using them to earn money. The University will support me in asserting and pursuing my rights, and my copyrights, in such matters.

ON THE USE OF GENERATIVE ARTIFICIAL INTELLIGENCE (e.g., ChatGPT)

The use of generative artificial intelligence tools or apps for assignments in this course, including tools like ChatGPT and other AI writing or coding assistants, is prohibited. The knowing use of generative artificial intelligence tools, including ChatGPT and other AI writing and coding assistants, for the completion of, or to support the completion of, an examination, term test, assignment, or any other form of academic assessment, may be considered an academic offense in this course. Representing as one's own an idea, or expression of an idea, that was AI-generated may be considered an academic offense in this course. Students may not copy or paraphrase from any generative artificial intelligence applications, including ChatGPT and other AI writing and coding assistants, for the purpose of completing assignments in this course. I will allow for the use of AI tools to help you in improving your English writing, but not in the generation of that writing to answer questions. This course policy is designed to promote your learning and intellectual development and to help you reach course learning outcomes.

IN-PERSON LECTURE AND TUTORIAL OUTLINE / SCHEDULE

Date	Lecture Content	Tutorials/Assignments
Sept. 6	1. Guest Lecture: Ground Rules, Introduction, the Historical Development of Hydrology, and Some Basic Concepts in Hydrology Reading: Chapter 1 (<i>all refer to Davies, 3rd edition</i>)	NO TUTORIAL THIS WEEK.
Sept. 13	2. Hydrological Concepts and the Physical Properties of Water Reading: Chapter 1	TUTORIAL #0 THIS WEEK.
Sept. 20	3. Energy in Hydrology Reading: Not much in book (bit in Ch. 3 “Available Energy”)	TUTORIAL #1 THIS WEEK.
Sept. 27	4. Guest Lecture: Precipitation and Interception Reading: Chapter 2	NO TUTORIAL THIS WEEK.
Oct. 4	5. Averaging Precipitation; Snow and Snowmelt Reading: Chapter 2 and latter half chapter 4	ASSIGNMENT #1 DUE. TUTORIAL #2 THIS WEEK.
Oct. 11	NO CLASSES THIS WEEK – FALL READING WEEK	
Oct. 18	6. Evapotranspiration Reading: Chapter 3	NO TUTORIAL THIS WEEK.
Oct. 25	7. Soil Moisture and Infiltration Reading: Chapter 6	ASSIGNMENT #2 DUE. TUTORIAL #3 THIS WEEK.
Nov. 1	8. Percolation and Groundwater Reading: Chapter 5	NO TUTORIAL THIS WEEK.
Nov. 8	9. Runoff Generation Reading: Chapter 7	ASSIGNMENT #3 DUE. TUTORIAL #4 THIS WEEK.
Nov. 15	10. Streamflow, Runoff Regimes and Measurement Reading: Chapters 7 and 8	NO TUTORIAL THIS WEEK.
Nov. 22	11. Streamflow Analysis and Hydrological Modelling Reading: Chapter 9	ASSIGNMENT #4 DUE (by midnight today).
Nov. 29	12. Water Quality OR Climate Change and Hydrology Reading: Chapter 10	NO TUTORIAL THIS WEEK.

ONLINE QUIZ SCHEDULE

Quiz due by	Based on material completed
Sept 15, 3 pm	Sept 6 and 13
Sept 29, 3 pm	Sept 20 and 27
Oct 20, 3 pm	Oct 4 and 18
Nov 3, 3 pm	Oct 25 and Nov 1
Nov 17, 3 pm	Nov 8 and 15
Dec 1, 3 pm	Nov 22 and 29

Quizzes are completed online via Quercus. You will have one attempt for each quiz with a total duration of only 15 minutes (10 questions). ***Please find a quiet place with a good internet connection and double-check you are prepared to start the quiz, before you actually start a quiz. If you run into a technical problem outside of your control, take a screenshot (or photo with your phone) and send it to me (Professor Mitchell) via email along with a brief explanation of the problem - and we'll figure something out.***