

# **University of Toronto at Scarborough** **“PRINCIPLES OF HYDROLOGY”**

(EES B04H3F, Fall 2018)

**Professor:** C.P.J. Mitchell      **Phone:** 416 208 2744      **Office:** EV-450  
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**Lecture Time:** Wednesdays, 1-3 pm; SW-128  
**Office Hours:** Tuesdays, 10-11:30 am and by appointment.  
**Course Web Site:** Everything on Quercus (<https://q.utoronto.ca>)  
**Teaching Assistants:** Planck Huang ([planck.huang@utoronto.ca](mailto:planck.huang@utoronto.ca))  
Bryan Flood ([bryan.flood@mail.utoronto.ca](mailto:bryan.flood@mail.utoronto.ca))

**Practical Times:** Tut01: Thursdays, 11am-1pm, Room AA207  
Tut02: Wednesdays, 3-5pm, Room AA207  
Tut03: Thursdays, 11am-1pm, Room HW402  
Tut04: Wednesdays, 11am-1pm, Room HW408  
**NOTE: Tutorial rooms are subject to change and often do.**

**Text:** "Fundamentals of Hydrology, Second Edition"  
[Author: Tim Davie; Publisher: Routledge, 200 pages]

## **INTENT OF THE COURSE**

Hydrology is the study of the occurrence, circulation, and distribution of water on the earth and in its atmosphere. The 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 ongoing 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 ( $\text{NO}_3^-$ ), 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. In order to understand, we have to make measurements. In order to make measurements we have to have some information about how the system works 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**

Mid-Term Test (Out of class; scheduled by Registrar)	20%
Four Assignments worth 10% each	40%
Final Examination (Scheduled by Registrar)	40%

## ASSIGNMENTS/TUTORIALS

You will have 4 assignments during the term, worth 40% 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 used by hydrologists in the field. You will be given assignments via Quercus that you need to bring to your tutorials, where TAs will instruct you on how to complete any necessary work and accompanying problem sets. Assignments are due on the dates shown in the schedule below. All assignments are due to your TA as a **printed hard-copy** (never by email unless specifically instructed to do so) at the START of your tutorial time slot, except practical #4, which is due to Professor Mitchell at the START of the second last lecture of the year. **Attendance at tutorials is mandatory.** This includes “tutorial #0”, which is an overview of basic math skills needed for the course and is crucial for getting information: you must attend! Part of the mark on your assignment (typically 10%) will be devoted to your attendance and active participation in tutorial exercises. Note that although tutorial rooms are included in this syllabus, sometimes they change the room without notifying anyone (often not even me). I will do my best ahead of time to let you know if rooms change.

In completing your assignments, you should use a word processor for your written responses in your assignments. **Calculations may be handwritten.** If you have graphs or tables to present in an assignment, either paste them into your Word 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 bear a handwritten name, signature, date and student number. I really think title pages are a waste of space and paper, so please don't bother with them.

## COURSE TEXT

"Fundamentals of Hydrology, Second Edition" by Tim Davie, in the Bookstore. "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 you are very well served by attending each and every lecture, where I expand on the content well beyond what is in the text. The very point of having a course taught to you (and not just reading a book) is the broader understanding, examples, and clarification that can be provided by your professor. **As far as your evaluation in this course goes (i.e., tests and exams), both assigned readings AND all lecture material are fair game.**

## MISSED TESTS/LATE PENALTIES FOR PRACTICALS

Make-ups will not be given for the mid-term test unless there are specific reasons (e.g, religious accommodations) that are **approved by me ahead of the midterm.** If you simply “miss” the mid-term, you will receive a mark of zero for it. There will be no exceptions.

Fundamentally, I feel that late assignments are entirely unacceptable. However, knowing that things do happen, my policy is that late assignments will be penalized at a rate of 20%/day and assignments more than one day late will simply not be accepted. In short, **if you are MORE than one day late, you will get a zero on the assignment.** If you fail to hand in your assignment on time during your tutorial slot (due date is specifically at the **start** of your tutorial), you will be assessed a late penalty. If you plan on handing in your assignment late, it is your responsibility to hunt down your TA to hand it in.

## INTERACTION WITH THE PROFESSOR AND TEACHING ASSISTANTS

Professor Mitchell strongly encourages you to come to see him and speak with him about any facet of the course, portions you are having difficulty with, and things you found particularly interesting; all during his office hours, immediately following class, or otherwise by appointment. He very much enjoys speaking with students about Hydrology. Your TA(s) also have office hours 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 see Professor Mitchell in person (in particular, this includes questions about tests and exams). Neither Professor Mitchell nor the TA(s), however, will answer point-blank questions about specific questions on assignments ahead of them being due. If you attend all lectures and all laboratories in an attentive manner, you should be well-prepared for completing excellent assignments and performing well on the mid-term and final exam.

Each and every student is expected to attend EVERY lecture. Professor Mitchell will not re-teach an entire class to someone because they missed it. Please rely on your fellow colleagues in the class for missing notes. Lecture slides will be posted on Quercus, but Professor Mitchell elaborates well beyond what is written

on those slides; and you are responsible for knowing what is said in lecture, not just what is written on slides. Lecture slides are posted to facilitate your learning DURING lecture and for you to avoid having to, for example, copy large diagrams while you should be taking notes or listening. In my opinion (but this may not relate to everyone), the best way to take notes is to annotate the presentation slides with the important things I might say. All lecture notes will be posted on the Quercus prior to each scheduled lecture.

**Email policy:** If at all possible, every effort should be made to meet, in person, with either Professor Mitchell or the TA(s) for questions pertaining to the course and assignments. Short emails will usually be answered with appropriate, short responses. Long, drawn out questions and/or questions pertaining to very general subjects, which are likely to be of interest to the entire class, should be posted on as a Quercus Discussion so that the entire class may benefit from the answer. All emails should be sent via a “.utsc.utoronto.ca” or “.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.**

**Phone:** I’ve also listed my office phone number above. It’s there because you are indeed allowed to call me if you need a quick answer to something. Note that it is a landline though. Don’t text it – those text to voice things are annoying.

## QUERCUS INFORMATION

### Logging in to your Quercus Course Website

New to UofT this year, but as will be with all of your other courses, 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. I will work with you and AccessAbility Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC AccessAbility Services staff (located in S302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. (416) 287-7560 or [ability@utsc.utoronto.ca](mailto:ability@utsc.utoronto.ca).

## STUDENT CODE OF CONDUCT

Please arrive promptly for lecture and make sure your phone is on silent. You are fully expected to abide by the Code of Student Conduct as set out by The Governing Council at the University of Toronto (<http://www.utoronto.ca/govcncl/pap/policies/studentc.html>). This document defines the standards by which students are to conduct themselves within class and within the University community at large. Please be advised that misconduct of any form will not be tolerated in this class. This includes plagiarism on tests, assignments, and exams, which will be strictly enforced and is easily detected. I am particularly sensitive to students finishing their own assignments. It’s OK to discuss with friends, but all forms of plagiarism, such as evidence of copying out equations or parts of answers will be dealt with very harshly. I warn you strongly, for example, not to have all the same wrong answers as your friends or to format your graphs the same way. If you have questions regarding what constitutes plagiarism or other academic offences, please do speak with Prof. Mitchell or your TA.

## LECTURE OUTLINE / SCHEDULE

DATE	LECTURE CONTENT	
Sept. 5	Ground Rules, Introduction, the Historical Development of Hydrology, and Some Basic Concepts in Hydrology  Reading: Chapter 1	<b>NO TUTORIAL THIS WEEK.</b>
Sept. 12	Basic Concepts in Hydrology, Hydrological Quantities, and The Hydrological Cycle  Reading: Chapter 1	<b>TUTORIAL #0 THIS WEEK.</b>
Sept. 19	Global Energy and Surface Radiation Balance, Precipitation, Interception and Throughfall  Reading: Chapter 2	<b>TUTORIAL #1 THIS WEEK.</b>
Sept. 26	Snow, Snowmelt, and Frozen Ground  Reading: some Chapter 4 (p. 71-76), otherwise lecture material	<b>NO TUTORIAL THIS WEEK.</b>
Oct. 3	Evapotranspiration  Reading: Chapter 3	<b>ASSIGNMENT #1 DUE. TUTORIAL #2 THIS WEEK.</b>
Oct. 10	NO CLASSES THIS WEEK – FALL READING WEEK	
Oct. 17	Soil Water and Infiltration Reading: Chapter 4 (p.56-61, 66-71)	<b>NO TUTORIAL THIS WEEK.</b>
Oct. 24	Groundwater, Groundwater-Surface Water Interactions  Reading: some Chapter 4 (p. 61-66), otherwise lecture material	<b>ASSIGNMENT #2 DUE. TUTORIAL #3 THIS WEEK.</b>
Oct. 31	Runoff and Streamflow  Reading: Chapter 5	<b>NO TUTORIAL THIS WEEK.</b>
Nov. 7	Runoff and Streamflow II  Reading: Chapter 5	<b>ASSIGNMENT #3 DUE. TUTORIAL #4 THIS WEEK.</b>
Nov. 14	Streamflow Analysis  Reading: Chapter 6	<b>NO TUTORIAL THIS WEEK.</b>
Nov. 21	Water Quality  Reading: Chapter 7	<b>ASSIGNMENT #4 DUE (IN CLASS).</b>
Nov. 28	Hydrology in the Urban Context or Field Measurements with Professor Mitchell (student choice)  Reading: Chapter 8	<b>NO TUTORIAL THIS WEEK.</b>