ENGG*3650 Hydrology

01

Fall 2020
Section(s): C01

School of Engineering
Credit Weight: 0.50
Version 1.00 - September 08, 2020

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1 Course Details

1.1 Calendar Description

Quantitative study of natural water circulation systems with emphasis on basic physical principles and interrelationships among major processes; characteristics of mass and energy; inputs to and output from watersheds; factors governing precipitation occurrence, evaporation rates, soil-water storage changes, groundwater recharge and discharge, run-off generation; methods of streamflow analysis; mathematical modeling.

Pre-Requisites: (ENGG*2230 or MET*2030), (MATH*1210 or MATH*2080), (STAT*2120 or STAT*2040), and competency in computing.

1.2 Timetable

Lectures:

Monday	10:30 AM – 11:20 AM	AD-S; VIRTUAL
Wednesday	10:30 AM – 11:20 AM	AD-S; VIRTUAL
Friday	10:30 AM – 11:20 AM	AD-S; VIRTUAL

Tutorials:

Tuesday (Section 01)	10:00 AM – 10:50 AM	AD-S; VIRTUAL

Thursday (Section 02)	10:00 AM – 10:50 AM	AD-S; VIRTUAL

1.3 Final Exam

December 15, 2020, 8:30 AM -10:50 AM, Room TBA

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2 Instructional Support

2.1 Instructional Support Team

Instructor: Prasad Daggupati PhD.
Email: pdaggupa@uoguelph.ca
Telephone: +1-519-824-4120 x58303
Office: THRN 3523
Office Hours: Friday 11:30 AM to 1:30 PM or by appointment

Lab Technician: Ryan Smith
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Telephone: +1-519-824-4120 x53278
Office: THRN 1114

2.2 Teaching Assistants

Teaching Assistant: Hannah May
Email: hmay@uoguelph.ca
Office Hours: TBA on CourseLink

Teaching Assistant: Reza Khalidy
Email: rkhalidy@uoguelph.ca
Office Hours: TBA on CourseLink

Teaching Assistant: Sepideh Emami Tabrizi
Email: semamita@uoguelph.ca

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3 Learning Resources

3.1 Required Resources

Course Website (Website)
http://courselink.uoguelph.ca
Course material, news, announcements, and grades (except final) will be regularly posted to the ENGG*3650 CourseLink site. You are responsible for checking the site regularly.

3.2 Recommended Resources

There is no officially required textbook for this course, however, the recommended text below is highly recommended. (Textbook)

Bedient, P.B., W.C. Huber and B.E. Vieux 2018. Hydrology and Floodplain Analysis. 6th ed., Prentice Hall, Upper Saddle River, NJ. (Textbook)

3.3 Additional Resources

Dingman, S.L. 2014. Physical Hydrology. 3rd ed., Waveland Press Inc. (Textbook)

Viessman, W. and G.L. Lewis 2002. An Introduction to Hydrology. 5th ed., Pearson. (Textbook)

Hydrology, An Introduction, Custom Edition for University of Guelph, Prentice Hall, Toronto. (Textbook)

Chow, V.T., D.R. Maidman and L.W. Hays 1988. Applied Hydrology. McGraw Hill, New York. (Textbook)

3.4 Communication & Email Policy

Please use lectures and tutorial sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.** As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

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4 Learning Outcomes

This course on hydrology is a core course in water resources engineering and environmental engineering programs. The main goals of the course are (1) to teach students the components of the hydrologic cycle and (2) to provide description of basic hydrologic processes including precipitation, watershed abstractions, stream flow characteristics, hydrograph analysis, overland and channel flow routing, hydrologic time series analysis, ground water in hydrology and simulation of hydrologic processes.

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Recognize and quantify basic hydrologic processes, such as runoff generation, infiltration and evaporation, in order to perform analyses of the hydrologic functioning of a watershed.
2. Describe commonly-used methods of measuring quantities which are important in hydrologic calculations.
3. Select and apply methods of calculation to obtain quantitative estimates of the response of a watershed to atmospheric inputs.
4. Apply statistical methods to assess the relative frequency of hydrologic events and

determine the risk associated with the selection of specific hydrologic design values for inputs and/or outputs from watersheds.
5. Apply a representative hydrologic model and describe its attributes, strengths and weaknesses.
6. Apply stream gauging techniques to measure the velocity and compute the discharge in a river.
7. Understand the effect of natural and anthropogenic impacts on hydrologic processes occurring in watersheds.

4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome	Learning Outcome
1	Knowledge Base	1, 2
1.4	Recall, describe and apply program-specific engineering principles and concepts	1, 2
2	Problem Analysis	1, 2, 3, 4
2.2	Identify, organize and justify appropriate information, including assumptions	1, 2, 3, 4
2.4	Execute an engineering solution	1, 2, 3, 4
5	Use of Engineering Tools	5
5.2	Demonstrate proficiency in the application of selected engineering tools	5
5.3	Recognize limitations of selected engineering tools	5
7	Communication Skills	5, 6
7.1	Identify key message(s) and intended audience in verbal or written communication as both sender and receiver	5, 6
7.3	Construct the finished elements using accepted norms in English, graphical standards, and engineering conventions, as appropriate for the message and audience	5, 6
9	Impact of Engineering on Society and the Environment	7
9.1	Analyze the safety, social, environmental, and legal aspects of engineering activity	7
9.3	Anticipate the positive and negative impacts of introducing innovative technologies to solve engineering problems	7

5 Teaching and Learning Activities

5.1 Lecture Schedule

Week	Topic	Description
1	**Introduction**	Course overview, definition of hydrology, historical development, global and regional water quantities, hydrologic cycle, water budget analysis
2-3	**Precipitation**	Storm types and their formation, point versus areal precipitation values, spatial and temporal averaging techniques, measurement techniques and analysis of precipitation
4-5	**Hydrologic abstractions**	Infiltration (description, measurements and calculation)
5-6	**Hydrologic abstractions**	Evapotranspiration (description, measurement and calculation)
7-8	**Stream flow and runoff**	Streamflow characteristics, components of hydrograph, surface runoff, baseflow, interflow, measurement of stream flows and analysis of runoff
9-10	**Hydrologic analysis and simulation**	Hydrograph analysis using unit hydrograph and synthetic unit hydrograph methods, overview of hydrologic models, and hydrologic modelling
10-11	**Flood routing**	Hydrologic routing (storage indication, Muskingum methods), hydraulic routing and watershed analysis for the purposes of routing
12	**Frequency analysis**	Review of probability concepts, return periods, common probabilistic models and model fitting, risk and design levels

Disclaimer: *Slight change in the sequence of topics is possible.*

5.2 Lab Schedule

Tutorial activity	Date	
	Section 01	Section 01
Introduction: Stream gauging laboratory	15-Sep	17-Sep
Tutorial problems 1: Water balance*	22-Sep	24-Sep
Introduction: Watershed group problem solving challenge	29-Sep	1-Oct
Tutorial problems 2: Precipitation*	6-Sep	7-Sep
Tutorial problems 3: Infiltration*	13-Oct**	15-Oct
Tutorial problems 4: Evapotranspiration*	20-Oct	22-Oct
Group work: Watershed group problem-solving challenge	27-Oct	29-Oct
Introduction: Hydrologic modeling assignment	3-Nov	5-Nov
Tutorial problems 5: Streamflow and runoff*	10-Nov	12-Nov
Group work: Hydrologic modeling assignment	17-Nov	19-Nov
Presentations: Watershed group problem solving challenge*	24-Nov	26-Nov
Presentations: Watershed group problem solving challenge*	1-Dec	3-Dec

* indicates submission of seminar learning activity

** October 13 is a holiday and the lab will be conducted during lecture hours or through a pre-recording and will

be discused prior to October 13.

5.3 Other Important Dates

Thursday, September 10

• Classes commence

Friday, September 18

• Last day to add F20 courses

Monday, October 12

• Holiday--NO CLASSES SCHEDULED -- classes rescheduled to Friday, December 4

Tuesday, October 13

Fall Study Break Day - NO CLASSES SCHEDULED -- classes rescheduled to Thursday, December 3

Wednesday, October 14

• Fall Break ends and classes resume

Wednesday, December 2

• Last day for regularly scheduled classes

Thursday, December 3

• Classes rescheduled from Tuesday, October 13, Tuesday schedule in effect

Friday, December 4

• Classes rescheduled from Monday, October 12, Monday schedule in effect

• Classes conclude

• Last day to drop F20 one-semester courses and S20/F20 two-semester courses Last day for in-course students to apply for co-op programs that permit entry in Winter 2021

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6 Assessments

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Stream gauging laboratory	10
Hydrologic modeling assignment	15
Seminar learning activities	20
Midterm Exam	25
Final examination	30
Practice problems	0
Total	100

6.2 Assessment Details

Stream gauging laboratory (10%)
Due: Fri, Oct 2
Learning Outcome: 6

Details: Each student will be required to determine the total discharge of a local river. Typically it's a field-based exercise where students in groups go to a river and perform several measurements (depths, velocities, etc) across a cross-section of a river. Due to COVID 19, the field-data collection part is video recorded. In addition, students will also investigate other stream discharge measurement techniques and will also analyze streamflows in various rivers across southern Ontario. Information will be distributed during the first tutorials on September 14 week.

Hydrologic modeling assignment (15%)
Due: Fri, Nov 27
Learning Outcome: 5

Details: There will be a group assignment on the application of a hydrologic model. Each group will work with a computer model to simulate the hydrologic response of a watershed to various conditions. Students will be required to prepare the data and input files, run the program, and analyze the simulated results.

Seminar learning activities (20%)
Date: Thu, Sep 10 - Mon, Nov 30
Learning Outcome: 1, 3, 4, 7

Details: Tutorials will be used for additional examples, introducing assignments, and working through various seminar learning activities throughout the semester. These activities include seminar problem sets and a watershed group problem-solving challenge, as described below.

Seminar problem sets (5%): Problem sets will be completed throughout the semester (see the schedule in Section 5.2). Problem sets are to be worked by the students and the TA will assist in solving the problem. Students are **highly advised to solve/master the tutorials** on their own as it is very essential to be successful in the midterm and final exams.

Watershed group problem-solving challenge (15%): A watershed group problem-solving exercise will be introduced to students in the tutorial in the week of September 28. This exercise will have students explore an issue related to watersheds and hydrology from the recent news and discuss their approach to solving the problem. Students will work on the group exercise in tutorials in the week of October 26 and present their findings virtually in a conference-style "poster presentation" during the last two weeks of tutorials.

Midterm Exam (25%)
Date: Fri, Oct 30
Learning Outcome: 1, 2, 3, 7

The midterm exam is worth 25% of the student's final grade in the course. The exam will be held during class time online synchronously. The tests will not be invigilated. You should submit your answers via the Dropbox in CourseLink.

Final examination (30%)
Date: Tue, Dec 15, 8:30 AM - , 10:20 AM, Location to be announced
Learning Outcome: 1, 2, 3, 4, 7

Practice problems (0%)
Date: Thu, Sep 5 - Fri, Nov 29
Learning Outcome: 1, 3, 4

A list of practice problems will be provided (posted to CourseLink) periodically throughout the semester to coincide with lecture topics. Practice problems are not required to be handed in. Solutions will be posted to CourseLink approximately one week after the practice problem set is posted.

6.3 Passing the course

To pass the course you must pass either the Final Examination (>= 50%) or pass the mid-term exam (>= 50%). Any student failing both the Final Examination and the mid-term will receive their Final Examination mark (i.e., < 50%) as their final mark for the course.

6.4 Assignments and laboratory submissions

You are encouraged to discuss the stream gauging laboratory and the hydrologic modelling

assignment with the instructor, TA and with members of the class, but copying is not permitted. Copying is similar to plagiarism in that it involves the appropriation of others' work as one's own. It includes copying in whole or in part another's test or examination answer(s), laboratory report, essay, or other assignment. Copying also includes submitting the same work, research or assignment for credit on more than one occasion in two or more courses, or in the same course, without the prior written permission of the instructor(s) in all courses involved (including courses taken at other post-secondary institutions).

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7 Course Statements

7.1 Course Grading Policies

Missed assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please contact the course instructor. See the undergraduate calendar for information on regulations and procedures for Academic Consideration:
http://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/sec_d0e1400.shtml

Accommodation of religious obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

Missed midterm: If you miss the midterm due to grounds for granting academic consideration or religious accommodation, the weight of the missed midterm will be added to the final exam. There will be no makeup midterm.

Late lab reports or assignments: Late submissions of assignments/reports will receive a 10% penalty per day. Lab reports or assignments submitted after five days past the due date will no longer be accepted.

The passing grade for this course is 50%.

8 School of Engineering Statements

8.1 Instructor's Role and Responsibility to Students

The instructor’s role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on Courselink but these are not intended to be stand-alone course notes. Some written lecture notes will be presented only in class. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes.

Scheduled classes will be the principal venue to provide information and feedback for tests and labs.

8.2 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and lab sessions. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

8.3 Lab Safety

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

9 University Statements

9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Graduate Calendar - Grounds for Academic Consideration
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions
https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml

9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are

available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Graduate Calendar - Registration Changes
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml

Associate Diploma Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website
https://www.uoguelph.ca/sas

For Ridgetown students, information can be found on the Ridgetown SAS website
https://www.ridgetownc.com/services/accessibilityservices.cfm

9.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Graduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars
https://www.uoguelph.ca/academics/calendars

9.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings and academic schedules. Any such changes will be announced via CourseLink and/or class email. All University-wide decisions will be posted on the COVID-19 website (https://news.uoguelph.ca/2019-novel-coronavirus-information/) and circulated by email.

9.10 Illness

The University will not normally require verification of illness (doctor's notes) for fall 2020 or winter 2021 semester courses. However, requests for Academic Consideration may still require medical documentation as appropriate.
