



ENGG*4250 Watershed Systems Design

Winter 2019

Section(s): C01

School of Engineering

Credit Weight: 0.75

Version 1.00 - January 05, 2019

1 Course Details

1.1 Calendar Description

This course is a hydrological analysis of watershed systems including stream flow for design of structures and channels, flood warning, flood plain mapping and low-flow characteristics. Hydraulic analysis is applied to the design of dams, reservoirs, control structures, energy dissipation structures, bridges and culverts. An analysis of steady flow profiles, flood waves, and sediment transport is applied in the design of natural and constructed channels and protective works for rivers to achieve environmentally sustainable land use in watershed systems.

Pre-Requisite(s): ENGG*2230, ENGG*3650

1.2 Course Description

This is a senior level design course in water resources that integrates across many of the foundational courses in water resources (water management, fluid mechanics, hydrology) and the design core of engineering. This major aim is to apply these at the watershed scale to develop design solutions for typical watershed problems.

1.3 Timetable

Lectures:

Tuesday 11:30 – 12:50 pm ALEX 309

Thursday 11:30 – 12:50 pm ALEX 309

Laboratory/tutorial:

Tuesday 3:30 – 5:20 pm THRN 1002

1.4 Final Exam

April 11, 2019, 14:30 - 16:30.

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

2 Instructional Support

2.1 Instructional Support Team

Instructor:	Bahram Gharabaghi , Ph.D., P.Eng.
Email:	bgharaba@uoguelph.ca
Telephone:	+1-519-824-4120 x58451
Office:	THRN 2417
Office Hours:	TBA on CourseLink and by appointment

2.2 Teaching Assistant(s)

Teaching Assistant:	Brett Snider
Email:	bsnider01@uoguelph.ca

3 Learning Resources

3.1 Required Resource(s)

Course Website (Website)

Course material, news, announcements, and grades will be regularly posted to the ENGG*4250 CourseLink site. You are responsible for checking the site regularly.

Open Channel Hydraulics (Textbook)

Terry W. Sturm.

3.2 Recommended Resource(s)

Open-channel hydraulics (Textbook)

Chow, V.T. 1959. McGraw-Hill, New York.

Available in Library

Applied hydrology (Textbook)

Chow, V. T. 1988. McGraw-Hill.

Available in Library

4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. Apply hydrological techniques to obtain flow rates for the design of conveyance and storage systems.
2. Apply the laws of conservation of mass, energy and momentum to the analysis of hydraulic conditions in conveyance structures and storage facilities.
3. Translate water-related needs into system performance criteria for design purposes.
4. Design open channel networks for water conveyance and storage.
5. Employ standard software in the solution of flow problems and in design calculations.

4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome	Learning Outcome(s)
1	Knowledge Base	1, 2, 4
1.1	Recall, describe and apply fundamental mathematical principles and concepts	1, 2, 4
1.2	Recall, describe and apply fundamental principles and concepts in natural science	1, 2, 4
1.3	Recall, describe and apply fundamental engineering principles and concepts	1, 2, 4
1.4	Recall, describe and apply program-specific engineering principles and concepts	1, 2, 4
2	Problem Analysis	4
2.1	Formulate a problem statement in engineering and non-engineering terminology	4

#	Outcome	Learning Outcome(s)
2.2	Identify, organize and justify appropriate information, including assumptions	4
2.3	Construct a conceptual framework and select an appropriate solution approach	4
2.4	Execute an engineering solution	4
2.5	Critique and appraise solution approach and results	4
3	Investigation	3, 4
3.1	Propose a working hypothesis	3, 4
3.2	Design and apply an experimental plan/investigative approach (for example, to characterize, test or troubleshoot a system)	3, 4
3.3	Analyze and interpret experimental data	3, 4
3.4	Assess validity of conclusions within limitations of data and methodologies	3, 4
4	Design	4, 5
4.1	Describe design process used to develop design solution	4, 5
4.2	Construct design-specific problem statements including the definition of criteria and constraints	4, 5
4.3	Create a variety of engineering design solutions	4, 5
4.4	Evaluate alternative design solutions based on problem definition	4, 5
4.5	Develop and refine an engineering design solution, through techniques such as iteration, simulation and/or prototyping	4, 5
5	Use of Engineering Tools	4, 5
5.1	Select appropriate engineering tools from various alternatives	4, 5
5.2	Demonstrate proficiency in the application of selected engineering tools	4, 5
5.3	Recognize limitations of selected engineering tools	4, 5
7	Communication Skills	4, 5
7.1	Identify key message(s) and intended audience in verbal or written communication as both sender and receiver	4, 5

#	Outcome	Learning Outcome(s)
7.2	Interpret technical documentation such as device specification sheets, drawings, diagrams, flowcharts, and pseudocode	4, 5
7.3	Construct the finished elements using accepted norms in English, graphical standards, and engineering conventions, as appropriate for the message and audience	4, 5
7.4	Substantiate claims by building evidence-based arguments and integrating effective figures, tables, equations, and/or references	4, 5
7.5	Demonstrate ability to process oral and written communication by following instructions, actively listening, incorporating feedback, and formulating meaningful questions	4, 5
9	Impact of Engineering on Society and the Environment	3, 4
9.1	Analyze the safety, social, environmental, and legal aspects of engineering activity	3, 4
9.2	Evaluate the uncertainties and risks associated with engineering activities	3, 4
9.3	Anticipate the positive and negative impacts of introducing innovative technologies to solve engineering problems	3, 4
12	Life Long Learning	4
12.1	Identify personal career goals and opportunities for professional development	4
12.2	Self-assess skills relative to career goals and SOE defined learning outcomes	4
12.3	Demonstrate capability for continuous knowledge and skill development in a changing world	4

5 Teaching and Learning Activities

5.1 Lecture and Lab Topics

Week Lecture topics

1 Flow Measurement Devices

Lab topics

OFAT, FDC, and Flood Flows

2	Uniform Flow Computation	Reservoir & Channel Routing
3	Gradually Varied Flows	Water Surface Profiles
4	Design of Erodible Channels	Channel Design Examples
5	Term Test 1 and Review	HEC RAS Tutorial Part 1
6	Design Proposal Presentations	HEC RAS Tutorial Part 2
7	Rapidly Varied Flows	Micro Hydro Power Generators
8	Design of Spillways and Stilling Basins	Spillway & Stilling Basin Example
9	Design of Culverts	Culvert Design Examples
10	Term Test 2 and Review	Fish Ladder Design Examples
11	Design Project Presentations	Report Writing Tutorial
12	Review old Exams	Tutorials for the Final Exam

5.2 Other Important Dates

Monday, January 7: Classes commence

Monday, February 18 – Friday, February 22: WINTER BREAK

Friday, March 8: 40th Class Day. Last day to drop winter semester courses.

Friday, April 5: Last day of classes.

6 Assessments

6.1 Assessment Details

Term Test #1 - Tuesday February 5th, 2019, 11:30 am – 12:50 pm, ALEX 309 (20%)

Learning Outcome(s): 1,2

Design Proposal Presentations (Week 6, Tues & Thur), 11:30 am – 12:50 pm, ALEX 309 (10%)

Learning Outcome(s): 3

Term Test #2 - Tuesday March 19, 2019, 11:30 am – 12:50 pm, ALEX 309 (20%)

Learning Outcome(s): 2

Design Project Presentations (Week 11, Tues & Thur), 11:30 am – 12:50 pm, ALEX 309 (10%)

Learning Outcome(s): 3,5

Design Project Final Report - Thursday, April 4th, at noon - Hard Copy in ALEX 305 (20%)

Learning Outcome(s): 1,2,3,5

Final Exam - April 11, 2019, 14:30 - 16:30 (20%)

Learning Outcome(s): 1,2

6.2 Design Projects

The design projects will be completed in groups of four (occasionally 3 or 5) students. Each group will be required to present their design project proposal (in week 6) and the design project solution (in week 11) to the class and be prepared to defend their design solution with regards to safety, economic, social, and environmental considerations. A hard copy of the final design report must be handed in class (ALEX 305) and an electronic copy (pdf) on CourseLink on Thursday, April 4th, 2019, at noon. Late submissions will receive 2% per hour penalty.

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 email the course instructor. See the undergraduate calendar for information on regulations and procedures for Academic Consideration: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.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 Term Tests: If you miss one of the Term Tests due to grounds for granting academic consideration or religious accommodation, the weight of the missed test will be added to the final exam (i.e. there will not be a deferred Term Test 1); however, on the unlikely event that you miss both Term Tests, due to grounds for granting academic consideration or religious accommodation, a deferred Term Test 2 will be scheduled and the weight of the missed Term Test 1 will be added to the Final Exam.

Final Design Report: A hard copy of the final design report must be handed in class (ALEX 028) and an electronic copy (pdf) on CourseLink due on Thursday, April 5th, 2018, 4:30 PM. Late submissions will receive 2% per hour penalty.

Grade Dispute: If a student feels that a Design Report or Term Test was graded unfairly, or if there is an error in the grading, it should be brought to the attention of the Instructor by email within one week after the grade is posted on CourseLink. Scores will not be reconsidered beyond this period.

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>

9.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for course registration are available in the Undergraduate and Graduate 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>

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.

More information can be found on the SAS website

<https://www.uoguelph.ca/sas>

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>
