



ENGG*4250 Watershed Systems Design

Winter 2018

Section(s): C01

School of Engineering

Credit Weight: 0.75

Version 1.00 - January 05, 2018

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	4:00 – 5:20 pm	ALEX 028
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Thursday	4:00 – 5:20 pm	ALEX 028
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Laboratory/tutorial:

Thursday	11:30 – 1:20 pm	THRN 1006
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1.4 Final Exam

Wednesday, April 11, 2018, 8:30 - 10:30 am

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

2 Instructional Support

2.1 Instructor(s)

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: Rachel Walton

Email: waltonr@uoguelph.ca

Teaching Assistant: Brett Snider

Email: bsnider01@uoguelph.ca

3 Learning Resources

3.1 Required Resources(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 Resources(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

Successfully completing this course will contribute to the following:

#	Outcome Set Name	Course Learning Outcome
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 concepts and principles in natural sciences	1, 2, 4
1.3	Comprehend and apply fundamental engineering concepts	1, 2, 4
1.4	Comprehend and apply program-specific engineering concepts	1, 2, 4
2	Problem analysis	4
2.1	Formulate a problem statement in engineering and nonengineering terminology	4
2.2	Construct a conceptual framework	4
2.3	Identify, organize and justify appropriate information	4
2.4	Execute an engineering solution	4
2.5	Critique and appraise results	4
3	Investigation	3, 4
3.1	Propose and test working hypotheses	3, 4
3.2	Design and apply an investigation plan	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

#	Outcome Set Name	Course Learning Outcome
4.1	Describe the design process	4, 5
4.2	Construct design-specific problem statements	4, 5
4.3	Create engineering design solutions	4, 5
4.4	Develop engineering design solutions	4, 5
4.5	Assess engineering design solutions	4, 5
4.6	Implement engineering design solutions	4, 5
5	Use of engineering tools	4, 5
5.1	Select appropriate engineering tools from various alternatives	4, 5
5.2	Apply selected engineering tools	4, 5
5.3	Recognize limitations of selected engineering tools	4, 5
7	Communication skills	4, 5
7.1	Develop and deliver clear, key concepts using methods appropriate for the intended audience	4, 5
7.2	Critically evaluate received information	4, 5
7.3	Demonstrate active listening and follow instructions	4, 5
9	Impact of engineering on society and environment	3, 4
9.1	Analyze the social, environmental and legal aspects of engineering activity	3, 4
9.2	Summarize the common sources of uncertainty and risk in their engineering field	3, 4
9.3	Identify the impact 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	Analyze a self-assessment of skills relative to SOE defined learning outcomes	4
12.3	Identify and critique limits of their field	4

5 Teaching and Learning Activities

5.1 Lecture and Lab Topics

Week	Lecture topics	Lab topics
1	Flow Measurement Devices	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 8:** Classes commence
 - **Monday, February 19:** Winter Break begins--NO CLASSES SCHEDULED THIS WEEK
 - **Friday, March 9:** Fortieth class day--Last day to drop one-semester courses
 - **Friday, April 6:** Classes conclude
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6 Assessments

6.1 Assessment Details

Term Test #1 - Tuesday February 6th, 2018, 4:00 – 5:20 pm, ALEX 028 (20.00%)

Design Proposal Presentations (Week 6, Tues & Thur), 4:00 – 5:20 pm, ALEX 028 (10.00%)

Term Test #2 - Tuesday March 20, 2018, 4:00 – 5:20 pm, ALEX 028 (20.00%)

Design Project Presentations (Week 11, Tues & Thur), 4:00 – 5:20 pm, ALEX 028 (10.00%)

Design Project Final Report - Thursday, April 5th, 4:30 PM - Hard Copy in ALEX 028 (20.00%)

Final Exam - Wednesday, April 11, 2018, 8:30 - 10:30 am (20.00%)

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 028) and an electronic copy (pdf) on CourseLink on Thursday, April 5th, 2018, 4:30 PM. 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>

Passing Grade: In order to pass the course, you must pass both the group design project (including proposal, presentations, and final report combined worth 40%) and the exams (including the two term tests and a final exam combined worth 60%) course portions. Students must obtain a grade of 50% or higher on the exams portion (i.e. the sum of the term tests and the final exam grades should be at least 30%) of the course in order for the group design project portion (40%) of the course to count towards the final grade.

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 regulations and procedures for [Academic Consideration](#) are detailed in the Undergraduate Calendar.

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 [Dropping Courses](#) are available in the Undergraduate Calendar.

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: www.uoguelph.ca/sas

9.6 Academic Misconduct

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 discourages misconduct. 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.

The [Academic Misconduct Policy](#) is detailed in the Undergraduate Calendar.

9.7 Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate 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 which apply to undergraduate, graduate and diploma programs.

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