ENGG*4250 Watershed System Design
Winter 2016

School of Engineering

(Revised: January 4, 2016)

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1 Instructional Support

1.1 Instructor

Instructor: Andrew Binns, Ph.D.
Office: THRN 2414, ext. 54011
Email: binns@uoguelph.ca
Office hours: TBA on CourseLink and by appointment

1.2 Teaching Assistant

GTA	Email	Office	Office Hours
Etta Gunsolus	egunsolu@uoguelph.ca	THRN 2114	TBA on CourseLink

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2 Learning Resources

2.1 Course 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.

2.2 Required Resources

The prescribed text is *Open Channel Hydraulics* by Terry W. Sturm.

2.3 Recommended Resources

Fluids text, typically used in ENGG*2230

Hydrology text, typically used in ENGG*3650

Books in library of use:

Bedient, P. B. 1992. *Hydrology and floodplain analysis*. McGraw-Hill New York.

Bureau of Reclamation. 1987. *Design of Small Dams*. 3rd Edition, U.S. Department of the Interior Denver.

Chow, V.T. 1959. *Open-Channel Hydraulics*. McGraw-Hill, New York.

Chow, V. T. 1988. *Applied hydrology.* McGraw-Hill.

Henderson, F.M. 1966. *Open Channel Flow*. Macmillan Publishing New York.

Hwang. N.C. 1986. *Fundamentals of Hydraulic Engineering Systems*. Prentice Hall New York.

Petersen, M.S. 1986 *River Engineering*. Prentice-Hall Toronto

2.4 Additional Resources

Lecture Information: All the lecture notes will be posted on the ENGG*4250 CourseLink site at least one day prior to the lecture. You are expected to have access to these for each class.

Assignments: Download the assignments and projects according to instructions given in class.

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3 ASSESSMENT

3.1 Dates and Distribution

Basis of Course Grade

Assignments (2 worth 2.5% each)	5%
Design projects (3 worth 10% each)	30%
Midterm exam (Thursday, February 25, 10:00-11:20am)	30%
Final exam (Thursday, April 21, 7:00-9:00pm)	35%

You must obtain a passing grade (>50%) on the final exam to pass the course. If you do not, your final exam mark will be your final grade.

3.2 Individual Computational/Laboratory Assignments

During the semester there will be several sets of practice problems assigned, however, only one (1) laboratory/tutorial assignments will be submitted for grading. This assignment (*Hydraulic Modeling Assignment*) will be conducted using hydraulic computational modeling software. The assignment will be due on the following date:

Assignment	**Due date (in lab/tutorial)**
Hydraulic Modeling Assignment	Monday, March 14, 2016

Practice problems will typically be available on Monday of the week and will be discussed in the Monday tutorial. The hydraulic modeling assignment should be submitted as a hard copy and online unless specifically identified in the assignment. Late assignments will be accepted with a 10% penalty per day late. Assignments which are completed with the use of tools such as Excel or other software packages (i.e., HEC-RAS) will need to have the critical files submitted as well.

A second assignment will be due at various dates for each student throughout the semester. This assignment (*Watershed News Assignment*) consists of discussing and presenting a news item related to watershed systems during one of the Monday laboratory/tutorial periods. This assignment will be conducted in groups of two students. Due dates will be randomly assigned and posted to the CourseLink site before the second lecture.

Assignment	**Due date (in lab/tutorial)**
Watershed News Assignment	Posted to CourseLink in first week

3.3 Design Projects

The design projects will be completed in groups of approximately four students. Each of the three design reports will be presented in a suitable format such as that specified for course ENGG*3100. Important dates for the projects are outlined in Table 1. With three design projects each group will be required to present their design solution to the class and be prepared to defend their design solution and calculations. Your presentation and ability to handle technical questions will make up part of your grade on the design report.

Table 1: Project Dates

Design Project	**Due Date**	**Presentation Date**
#1	February 8	February 8 (in tutorial)
#2	March 7	March 7 (in tutorial)
#3	March 28	March 28 (in tutorial)

3.4 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: The passing grade for the course is 50%. As noted above, you must obtain a passing grade (>50%) on the final exam to pass the course. If you do not, your final exam mark will be your final grade.

Project Work: You must participate in and complete all phases of the project work in this course.

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4 AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

4.1 Calendar Description

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

Prerequisites: ENGG*2230 and ENGG*3650

4.2 Course Aims

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.

4.3 Learning Objectives

At the successful completion of this course, the student will have demonstrated the ability to:

(i) Apply hydrological techniques to obtain flow volumes and flow rates for the design of

conveyance and storage systems used in management of watershed flows.

(ii) Apply the laws of conservation of mass, energy and momentum to the analysis of hydraulic conditions in conduits, open channels, control structures and storage facilities.

(iii) Translate water-related needs into system performance criteria for design purposes.

(iv) Design open channel networks for water conveyance and storage.

(v) Employ standard software in the solution of flow problems and in design calculations.

Graduate Attributes

Successfully completing this course will contribute to the CEAB Graduate Attributes as outlined below.

Graduate Attribute	Learning Objectives	Assessment
1. Knowledge Base for Engineering	1, 2, 4	Assignments, Exam
2. Problem Analysis	4	Assignments, Project, Exam
3. Investigation	3, 4	Project, Assignments
4. Design	3, 4, 5	Project
5. Use of Engineering Tools	4, 5	Assignments, Project
6. Communication	4, 5	Project
7. Individual and Teamwork	-	-
8. Professionalism	-	-
9. Impact of Engineering on Society and the Environment	3, 4	Assignment, Project
10. Ethics and Equity	-	-
11. Economics & Project Management	-	
12. Life-Long Learning	4	Project

4.4 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. 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 project.

4.5 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and laboratories/tutorials. 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.

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5 TEACHING AND LEARNING ACTIVITIES

5.1 Timetable

Lectures:

Tuesday	10:00 – 11:20am	MCKN 317
Thursday	10:00 – 11:20am	MCKN 317

Laboratory/tutorial:

Monday	7:00 – 8:50pm	MCKN 304

5.2 Lecture Schedule

Lectures	*Subjects*
4	Coverage in Fluid Mechanics and Hydrology of fluid properties, pressure forces, Bernoulli equation with headloss, runoff generation, hydrograph modelling, routing calculations.
8	Flow in channels (uniform flow, Chezy and Manning's equation, specific energy and specific force, subcritical, supercritical flow, hydraulic jump, flow profiles in gradually varied flow, optimal hydraulic shape, and computation for complex channels)
4	Geometry of natural channels, sediment transport equations, design of channels for natural function
6	Hydraulic structures and machinery (weirs, flumes, culverts, bridge openings, spillways, stilling basins, low-flow pipes, valves, pumps, turbines)
2	System operations (reservoir outlet sizing, operation rules for gated and ungated structures, flood forecasting, flood wave behaviour)

5.3 Other Important Dates

January 11, 2016:	First day of class
February 15 – 19, 2016:	Winter break
March 11, 2016:	Last day to drop course – 40th class day
April 7, 2016:	Last day of class

6 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.

If the laboratory rules are not followed, consequences will include removing access to the lab. If this results in lab work not being completed, the student will receive a grade of 0.

7 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.

7.1 Resources

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:
http://www.academicintegrity.uoguelph.ca/

Please also review the section on Academic Misconduct in your Engineering Program Guide.

The School of Engineering has adopted a Code of Ethics that can be found at:
http://www.uoguelph.ca/engineering/undergrad-counselling-ethics

8 ACCESSIBILITY

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability for a short-term disability should contact the Centre for Students with Disabilities as soon as possible.

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.csd.uoguelph.ca/csd/

9 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, classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

10 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: http://www.uoguelph.ca/registrar/calendars/index.cfm?index