ENGG*3650 Hydrology

Fall 2013

School of Engineering

Revised: August 30, 2013

1. INSTRUCTIONAL SUPPORT

1.1 Instructor

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1.2. Teaching Assistants

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1.3. LAB ASSISTANT

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2 LEARNING RESOURCES

2.1 Course Website

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.

2.2 Required Resources

No text book is available to cover the entire course content. Guelph. To alleviate this problem the Pearson publisher has prepared a Custom Edition for the University of Guelph. This book covers most of the subject matter of this course. The book is not organized according to sequence of lectures.

2.3 Recommended Resources

Hydrology**,** An Introduction, Custom Edition for University of Guelph, Prentice hall, Toronto

2.4 Additional Resources

1. Bedient, P. B. and W.C. Huber 2012. Hydrology and Floodplain Analysis. 4th ed., Prentice Hall, Upper Saddle River NJ.
2. Bureau of Reclamation. 1987. Design of Small Dams. 3rd Edition, U.S. Department of the Interior, Denver.
3. Chow, V. T. D.R. Maidman and L.W. Hays.1988.. Applied Hydrology. McGraw Hill< New York

Lecture Information: Material is covered in lectures, with emphasis on the quantitative description of the various components of the hydrologic cycle such as precipitation, watershed abstractions, stream flow characteristics, hydrograph analysis, overland and channel flow routing, ,time series analysis ground water in hydrology and simulation of hydrologic processes.

2.5. Communication & Email Policy

Please use lectures and lab help 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 student

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3. Assessment

To pass t The breakdown of the grading scheme for the course is given below:

Stream Gauging Lab	-	5%
Modeling Assignment	-	5%

Quizzes	-	10%
Mid-term Examination	-	40%
Final Examination	-	40%

To pass the course you must pass either the MIDTERM or the FINAL. Any student failing both the MIDTERM and FINAL will receive their FINAL mark as the mark for the course. Furthermore, if you do better on the final exam than the midterm then your final exam will be given a higher weighting (or vice versa). The grade will be computed using the following scheme:

$$E = \max\{0.4F + 0.6M,\ 0.6F + 0.4M\}$$

$$G = 0.8E + 0.1Q + 0.1AL$$

Where: G = Final Course Grade, F = Final exam, M = Midterm exam,
Q = Sum of quizzes AL = Assignments + lab

Disclaimer: *The instructor reserves the right to change any or all of the above in the event of appropriate circumstances, subject to University of Guelph Academic Regulations*

3.1 Date and Distribution

Quizzes: 10% (weekly)
During the tutorial hour

Midterm: 40%
October 17, 2013 19:00 – 21:00; Room 103 Rozenski Hall

Final: 40%
December 9, 2013 8:30 – 10:30; Room To Be Announced

Model Computational Assignment: 5%
Due Date: November 22nd, 2013

Stream gauging Lab/oratory: 5%
Due Date: October. 31st, 2013

Practice Problems: A list of practice problems will be given in the beginning of the semester and will be assigned as the semester progresses.

Quizzes: Weekly quizzes will be held during most of the tutorial hour. There will be no quiz during first week, midterm week and the final week of the classes. Any other no quiz announcement will be made during the semester.

Model Computational Assignment: There will be one group assignment on the calibration and

validation of some components of hydrologic model. Each group will work with a computer model to simulate some components of the hydrologic cycle. They will be required to prepare the data files run the program, perform calibration and validation, and to analyze the simulated results.

Stream gauging Lab/oratory: Each student, as a part of a group of four, will be required to determine the discharge of a local river. This will be done in a separately scheduled lab during the first three or four weeks of the semester.

You are encouraged to discuss the stream gauging lab and the modelling assignment with the instructor, TAs 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).

3.2 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

The passing grade for this course is 50%.

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4. Aims, Objectives and Graduate Attributes

4.1 Calendar Description

Quantitative study of natural water circulation systems with emphasis on basic physical principles and inter-relationships among major processes; characteristics of mass and energy; inputs to and outputs from watersheds; factors governing precipitation occurrence, evaporation rates, soil-water storage changes, ground-water recharge and discharge, runoff generation; methods of stream flow analysis; mathematical modeling. Prerequisites ENGG*223 or

MET*2030, MATH*1210 or MATH*208*, STAT*2120 or STAT*2040, and competency in computing

4.2 Course Aims

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) 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..

4.3 Learning Objectives

At successful completion of this course, the students will have demonstrated ability 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.

4.4 Graduate Attributes

Graduate Attribute	**Learning Objectives**	**Assessment**
1. Knowledge Base for Engineering	1,2,3,4,5	Exams , Quiz, Assignments
2. Problem Analysis	2	Exam, Quiz, Assignments
3. Investigation	3	
4. Design		
5. Use of Engineering Tools	3	Assignments
6. Communication	5	Assignment, Lab
7. Individual and Teamwork	1,2,3,4,5	Exam, Quiz, Assignments, Lab
8. Professionalism	5	Assignments. Lab
9. Impact of Engineering on Society and the Environment	2, 4	

10. Ethics and Equity	-	-
11. Environment, Society, Business, & Project Management	1,2,3,4,5	-
12. Life-Long Learning	2,3,4	Exams, Quiz, and Assignments

4.5 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. As an ***instructor*** my responsibility is to create the environment for learning by presenting the course material in a clear manner, by providing necessary learning resources and by animating the class activities. I will be available to help you with any kind of problem you may have regarding the content of this course Material is covered in lectures will focus on hydrologic processes

The Teaching Assistant (TA) will go over the assignments in the tutorial period. You are encouraged to discuss the assignments with the instructor, TA and with members of the class but copying is not allowed. 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).

4.6 Students' Learning Responsibilities

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

- As a ***student*** your responsibility is to come to class on time, read the required readings before and/or after the class and ask questions in the class if you don't understand. Class attendance at the University of Guelph is not mandatory but research has shown that student's success rate is directly related to class attendance. Those who attend classes and tutorials generally have higher success rates than those who do not. If I am unable to assist you during the class, ask the question after class or during office hours. It is YOUR fault if you don't ask questions when you do not understand.
- You have the responsibility to consult with the course site regularly and will be responsible for the material posted on the site.
- ***Professors are human and can make error***. If you think that I have made an error, point it out during the class because it is easier for me to correct the mistake and set the learning back on track rather than waiting until next class.
- Don't disturb (by talking to) your classmates during the class just because you feel bored.
- Turn off your cellphone during the lecture and tutorial.

- If you have a commitment more important than the class and could not attend the class ask for material covered in the class from your classmate. If you are not too late enter the classroom with minimum disturbance.
- Do not leave during the class and interrupt your classmates and the instructor unless it is very important. If you know you have to leave during the class, have the courtesy to sit near an exit.

Students will be expected to carry out fairly extensive numerical computations. A set of problems will be given for practice purposes. The Teaching Assistant (TA) will go over some of the practice problems in the tutorial sessions. You are encouraged to discuss these problems with the instructor, TAs and with members of the class. The quizzes will be based on the material covered in the lectures and the practice problems related to the material covered

4.7 Relationships with other Courses & Labs

Previous Courses

ENGG*223 or MET*2030,
MATH*1210 or MATH*208*,
STAT*2120 or STAT*2040, and competency in computing.

The fundamental of fluid mechanics covered in ENGG2230, meteorological characteristics covered in MET*2030, calculus covered in Math01210 or Math*2080 and statistic and probability covered in STAT2120 or Stat2040 and competency in computing are applied to describe hydrological processes and to quantify hydrologic variables.

Follow-on Courses:

ENGG*4250. ENGG*4360, ENGG*4370, ENGG*4130, ENGG*4150

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5 Teaching and Learning Activities

5.1 Time Table

Lectures:

Monday	11:30 – 12:20	RICH 2529
Wednesday	11:30 – 12:20	RICH 2529
Friday	11:30 – 12:20	RICH 2529

Tutorial:

Wednesday	14:30 - 15:20	MACK 031

5.2 Lecture Schedule

Week **Topic**

1. **Introduction:** Course overview, definition of hydrology, historical development, global and regional water quantities, hydrologic cycle, water budget analysis (LO1).
2. **Precipitation*:*** Storm types and their formation. Point vs. areal precipitation values, spatial and temporal averaging techniques, measurement techniques and analysis of precipitation (LO2, LO3).
3. **Hydrologic Abstractions:** Infiltration description, measurements and calculations, Evapotranspiration: description, measurement and calculation. Interception, depression storage, etc (LO1,LO2, LO3)
4. **Streamflow Characteristics:** Components of hydrograph, surface runoff, baseflow, interflow, measurement of streamflows and analysis of runoff(LO1,LO2, LO3) .
5. **Frequency Analysis:** Review of probability concepts, return periods, common probabilistic models and model fitting, risk and design levels (LO3, LO4).
6. **Hydrologic Time Series Analysis**: Stochastic time series, simple Markov models and generation of records.(LO3, LO4)
7. **Flood Routing:** Hydrologic routing: storage indication, Muskingum methods, hydraulic routing and watershed analysis for the purposes of routing(LO1,LO2, LO3).
8. **Groundwater in Hydrology:** Distribution and measurement, governing equations and simplifications for flow analysis and basic well hydraulics(LO1,LO2, LO3) .
9. **Snow Hydrology:** Distribution and measurement of snow, methods for the estimation of snowmelt and determination of runoff from snowmelt process(LO1,LO2, LO3).
10. **Hydrologic Simulation:** Hydrologic modelling, types of hydrologic models, model selection, model evaluation including sensitivity analysis, calibration and validation.(LO5).
11. **Hydrologic Design:** Frequency levels, design storms/continuous records and minor structure design (LO2,LO3,LO4).
12. **Urban Hydrology:** Characteristics of urban hydrology, run-off analysis, types of simulation models and major model characteristics (Lo1, Lo3, Lo5).

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

5.4 Lab Schedule: Stream gauging lab will be conducted during first three to weeks of the semester depending upon the outside climatic conditions.

5.5. Other Important Dates: Not applicable

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6. 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.

6.1 Stream Gauging Laboratory Safety

Clearly follow the instructions of the technician or T.A. and act in professional manner

- Absolutely no horseplay or misconduct will be tolerated
- Do no attempt to modify or recalibrate the equipment.
- When in the stream move slowly and carefully – there can be unseen hazards below the water surface.
- Stream water is non-potable – DO NOT DRINK IT.
- The electronics used for this lab are NOT waterproof – keep them dry.
- Bring warm clothing – extra and tick socks to wear in waders – and note that a change of socks may be necessary.
- One person adjusts the wading rods, one takes readings and calls them to a person on shore, who records the readings.
- Sunscreen and insect repellent are recommended.
- The group must stay together or keep track of where the team members are at all times.
- Fabric tap measures are not to be tied – they are to be able to rebound properly
- All equipment is to be returned to the technician or T.A. before leaving the site; waders must be stored right side out.

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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