School of Engineering
University of Guelph

ENGG*3650: Hydrology

Course Description & Outlines - Fall 2012

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.

General Learning Objectives

Knowledge base	X	Design	X	Team work	X
Problem analysis	X	Engineering tools	X	Individual work	X
Life long learning	X	Impact on society	X	Economics and project management	
Investigation	X	Professionalism			
Communication		Ethics and equity			

Specific Course Objectives

For successful completion of this course, students will demonstrate their ability to:

(i) Recognize and quantify basic hydrologic processes, such as runoff generation, infiltration, evaporation, in order to perform analysis of the hydrologic functioning of a watershed.

(ii) Describe commonly-used methods of measuring quantities which are important in hydrologic calculations.

(iii) Select and apply methods of calculation to obtain quantitative estimates of the response of a watershed to atmospheric inputs.

(iv) 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.

(v) Apply a representative hydrologic model and describe its attributes, strengths and weaknesses.

Professor and TA information

Faculty Ramesh Rudra, P. Eng. Room 2343 Thornbrough Building. Ext 52110
Office Hours: Open Door Policy; e-mail: rrudra@uoguelph.ca

Teaching Assistants Jennifer Thompson, Room TBD
Email: jdrake@uoguelph.ca EXT. 52132 (General)
Maya Atieh, Room TBD
Email: matieh@uoguelph.ca EXT. 52132 (General)

Office Hours: TBD,

Class time and Location

Lectures	Tuesday	8:30 - 9:50	Room 117, MACK (MacKinnon)
	Thursday	8:30 - 9:50	Room 117, MACK (MacKinnon)
Tutorial	Thursday	16:30 - 17:20	Room 224, MACK (MacKinnon)
			Room 225, MACK (MacKinnon)

Midterm and Final Examination time and Location

Midterm:	October 25, 2012	19:00 – 21:00; Room 103 Rezonski Hall
Final	December 8, 2012	8:30 – 10:30; To be announced

Textbooks and Reference Books

Bedient, P. B. and W.C. Huber 2007. *Hydrology and Floodplain Analysis*. 4th ed., Prentice hall, Upper Saddle River NJ.

Reference books on reserve at the library are:

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

Chow, V. T. D.R. Maidman and L.W. Hays.1988. *Applied Hydrology*. McGraw Hill.

Course Organization

- The proposed schedule of topics is shown below in the topic section.
- A 2 hour mid-term test will be held on October 25, 2012 and a 2 hour final test on December 8, 2012.
- Bi-weekly quizzes will be held on alternate weeks.
- The Courselink platform will be used to exchange course information

Responsibilities and Tasks

- 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.

- 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) your classmates and instructor during the class just because you feel bored.
- Turn off cellphone during the lecture and tutorial.
- If you have 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.

Topics:

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

Methods of Evaluation

A student must pass either the MIDTERM or the FINAL to pass the course. Any student failing MIDTERM and FINAL will receive the FINAL mark as the mark for the course. For students passing the MIDTERM and/or the FINAL the grades will be determined using the following scheme:

Stream Gauging Lab	-	5%
Modeling assignment	-	5%
Quizzes	-	10%
Mid-term examination	-	40%
Final examination	-	40%

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.*

Computation Skills

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.

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/Assignment

Each student, as a part of a group of three or four, will be required to determine the discharge of a local river. This will be done in a separately scheduled lab.

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).

University Policy on Academic Misconduct

Academic misconduct, such as plagiarism, is a serious offence at the University of Guelph. Please consult the Undergraduate Calendar 2012-2013 and School of Engineering programs guide, for offences, penalties and procedures relating to academic misconduct.
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml