

**School of Engineering
University of Guelph**

ENGG*3650: Hydrology

Course Description & Outlines - Fall 2008

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.

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 analyses of the hydrologic functioning of a watershed.
- (ii) Describe commonly-used methods of measurement for quantities important for 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.

Faculty

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Teaching Assistant

Andrew Oosting, Room TBA, Thornbrough Building.
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Office Hours: TBD,

Class time and Locations

Lectures	Tuesday	13:00 - 14:20	Room 116, Crop Science
	Thursday	13:00 - 14:20	Room 116, Crop Science
Tutorial	Friday	10:30 - 11:20	Room 116, Crop Science

Midterm and Final Examination time and Location

Midterm:	October 22, 2008	19:00 – 21:00; Room 117 MacKinnon
Final	December 4, 2008	19:00 – 21:00; 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 lecture topics is shown below.

A 2 hour mid-term test will held on October 25.

Efforts will be made to use WebCT platform for exchange of course information. All students are expected to consult with the course site regularly and will be responsible for the material posted on this site.

Topics:

1. Introduction: course overview, background data, global and regional water quantities, hydrologic cycle , water budget analysis. Precipitation: storm types and their formation
2. Precipitation: point vs areal precipitation values, spatial and temporal averaging techniques. measurement techniques and analyses of precipitation

3. Hydrologic Abstractions: Infiltration description, measurements and calculations, Evapotranspiration: description, measurement and calculation.
4. Hydrologic Abstractions: Evapotranspiration: description, measurement and calculation and interception, depression storage, etc Streamflow Characteristics: Components of hydrograph, baseflow, interflow.
5. Streamflow characteristics: Components of hydrograph, baseflow, interflow,, measurement of streamflows and analysis of runoff.
6. Frequency Analysis: review of probability concepts, return periods, common probabilistic models and model fitting , risk and design levels
7. Hydrologic Time Series Analysis: stochastic time series, simple Markov models and generation of records
8. Flood Routing: hydrologic routing: storage indication, Muskingum methods, hydraulic routing and watershed analysis for the purposes of routing
9. Groundwater Movement: distribution and measurement, governing equations and simplifications for flow analysis and basic well hydraulics
10. Snow Hydrology: distribution and measurement of snow, energy budget methods for the estimation of snowmelt and determination of runoff from snowmelt process. Hydrologic Design: frequency levels,
11. Hydrologic Design: design storms/continuous records and minor structure design. Urban Hydrology: characteristics of urban hydrology, run-off analysis
12. Hydrologic Simulation and Urban Hydrology: urban hydrology, types of simulation models and major model characteristics.

Basis of Course Grade

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

Stream Gauging Lab	-	5%
Computational Assignments	-	20%
Mid-term examination	-	35%
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. Some of these can most easily be done using a spreadsheet as a calculation aid. In one assignment a computer program will be made available. Students will be required to prepare the data files, to run the program, and to analyze the results obtained.

Individual Computational Assignments

There will be approximately six calculation assignments. The Teaching Assistant (TA) will go over the assignments in the tutorial period. You are encouraged to discuss the assignment 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).

Stream gauging Lab/Assignment

Each student, as 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.

University Policy on Academic Misconduct

Academic misconduct, such as plagiarism, is a serious offence at the University of Guelph. Please consult the Undergraduate Calendar 2007-2008 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>