

INTRODUCTION TO HYDROLOGY

Prerequisite

Either (a) GEOG 200/GEOB 200 or (b) GEOG 204/GEOB 204 or (c) AGRO 244/APBI 244.

Note: This is a science course. It is assumed that students have command of material from first year Mathematics and Physics. At a minimum, students must have a confident working knowledge of the following material from high school mathematics and science: functions and relations, algebra, trigonometry, atomic structure (electrons, neutrons, protons) and potential energy.

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Office hours: Tu Th 11:00-12:00, or by appointment

Lectures Tu, Th 9:30-11:00, Room G101

Labs L2A Tu 15:00 - 17:00 Room G229
L2B We 14:00 - 16:00 Room G214

TA Piotr Cienciala Contact info. TBA

Course web page

Copies of the syllabus, laboratory exercises and readings can be accessed via the course web page:

<http://www.geog.ubc.ca/courses/geob305/home.html>

Programme

1. *Lectures.* The focus of the lectures will be to introduce key concepts to provide a foundation for their practical application in the laboratory assignments.
2. *Laboratories.* There will be four laboratories to be handed in for marking, consisting of computational and interpretive exercises. There will also be five laboratories that will not include a marked component. However, students should attend these laboratory sessions, as the concepts and techniques presented will be “fair game” for inclusion on the midterm and final examinations.

The objectives of the laboratories are as follows:

- (1) to introduce general approaches to practical data analysis (e.g., fitting relations to data, error analysis),
- (2) to provide experience in applying theoretical concepts to the interpretation of hydrologic data, and
- (3) to introduce some of the "bread-and-butter" techniques of applied hydrology (e.g., flood frequency analysis).

Laboratory assignments must be handed in at the *beginning* of the laboratory session the following week. There will be a 10% penalty for each day a laboratory report is overdue; a 5% penalty will be applied for assignments submitted after the beginning of the laboratory session on the due date. If you will be unable to hand in an assignment by the due date and time for a legitimate reason, such as documented medical problems, please inform the TA *and* instructor as soon as possible, preferably prior to the due date.

Lab reports must be prepared in a neat and professional manner. Calculations should be clearly laid out with correct units and an appropriate number of significant figures, with the final answer clearly marked (e.g., by underlining). Verbal answers to interpretive questions must be written in a clear and concise style in proper English. In particular, we will not accept long, rambling answers that attempt to "cover all bases" in the hope of hitting the right answer. We reserve the right to reject lab reports that are not prepared according to these instructions. If an assignment is rejected, the student may revise and re-submit subject to the appropriate penalty for late submission.

Although collaborative effort is encouraged in working out problems, individually prepared reports must be submitted.

3. *Readings.* There is no suitable text book for this course. It is therefore critical that students attend the lectures and laboratory sessions and take notes. In the case of unavoidable absence, students should make arrangements to get notes from a fellow student.
4. *Examinations.* There will be an in-class midterm examination and a formal, scheduled final examination. You are responsible for attendance at the examinations: special arrangements cannot be made except for documented medical reasons. Both the mid-term and final examinations will involve computational problem-solving, as well as more conceptual questions.

In the event that a student misses an examination for a legitimate reason such as short-term illness, the normal procedure will be to have the student write an examination at an alternative time, to be agreed upon by the student and instructor. In the case of the midterm examination, the alternative examination must be taken within one week of the scheduled midterm examination. Should this not be possible, the marks associated with the midterm will be re-allocated, such that the assignments will be worth 35% and the final examination 65% in calculating the course grade.

Evaluation

Laboratories	30
Mid-term examination	25
Final examination	45
<u>TOTAL</u>	<u>100</u>

Course fees

There will be a course fee of \$20 to cover photocopying and lab costs. This fee can be paid to the TA during the first lab period.

SELECTED BIBLIOGRAPHY OF HYDROLOGY BOOKS

The list below provides a summary of some of the more relevant books that have been published on hydrology and related pure and applied sciences.

Berner, E.K and Berner, R.A. 1996. *The Global Environment: Water, Air and Geochemical Cycles*. Prentice-Hall, Englewood Cliffs. (earlier edition as *The Global Water Cycle*).

Although not strictly a hydrology text, this book provides good summaries of global-scale water cycling and properties of water. It also provides a good link between hydrology and other aspects of environmental science.

Black, P.E. 1991. *Watershed Hydrology*. Prentice-Hall, Englewood Cliffs.
A descriptive introduction to hydrology.

Brooks, K.N., Ffolliott, P.F., Gregorson, H.M. and DeBano, L.F. 2003. *Hydrology and the Management of Watersheds, Third Edition*. Blackwell Publishing, Ames.

A mainly descriptive treatment of watershed processes with a focus on the impacts of land use and implications for watershed management.

Bruce, J.P. and Clark, R.H. 1966. *Introduction to Hydrometeorology*. Pergamon, Oxford.

Although dated, this compact book still contains clear descriptions of many commonly used analytical techniques. Another plus is that it focuses on Canadian situations and examples.

Dingman, S.L. 2002. *Physical Hydrology, Second Edition*. Prentice-Hall, New Jersey.

An excellent advanced introduction. However, the level of mathematics and statistics used is frequently too high for a second- or third-year course. It also does not cover frozen ground or glaciers, both of which are important in a Canadian context.

Freeze, R.A. and Cherry, J.A. 1979. *Groundwater*. Prentice-Hall, Englewood Cliffs.

The classic reference text on groundwater. Although over 20 years old, the presentation of hydrogeology and groundwater flow is clearly written and still useful.

Hendriks, M.R. 2010. *Introduction to Physical Hydrology*. Oxford University Press, Oxford.

This would be a contender as an appropriate text for GEOB 305 except that it does not cover snow, glaciers or frozen ground, all of which are important in Canada.

Hewlett, J.D. 1982. *Principles of Forest Hydrology*. University of Georgia, Athens.

A straightforward introductory text with a focus on forested catchments. It provides illustrations of basic computations.

Leopold, L.B. and Dunne, T. 1978. *Water in Environmental Planning*. Freeman, San Francisco.

A well-written general book on hydrology with an emphasis on applied problem-solving. Although some sections are dated, much of the material in this book is still relevant.

Linsley, R.K., Kohler, M.A. and Paulhus, J.L.H. 1982. *Hydrology for Engineers, Third Edition*. McGraw-Hill, New York.

One of the best engineering-oriented treatments of hydrology. The level of mathematics and focus on engineering applications limit its applicability to this course.

Maidment, D.R. (editor) 1993. *Handbook of Hydrology*. McGraw-Hill, New York.

A good advanced reference text. If you could have only one hydrology book on your shelf, this would be a strong contender.

Miller, D.H. 1977. *Water at the Surface of the Earth*. Academic Press, New York.

A comprehensive but descriptive overview of the terrestrial hydrologic cycle.

Serrano, S.E. 1997. *Hydrology for Engineers, Geologists and Environmental Professionals: An Integrated Treatment of Surface, Subsurface and Contaminant Hydrology*. HydroScience Inc., Lexington.

This book provides a comprehensive look at hydrology from an applied perspective. It is strong on computational problems, but is in places weak on physical explanations.

Ward, R.D. and Robinson, M. 1999. *Principles of Hydrology, Fourth Edition*. McGraw-Hill, New York.

A relatively comprehensive treatment of hydrology. It would be an appropriate text for this course except that it tends to be weak on physical explanations of hydrologic phenomena.