

# Previous Year Course Outline Provided for Information Purposes Only

## **DEPT OF GEOGRAPHY & ENVIRONMENTAL STUDIES** **CARLETON UNIVERSITY**

### **Course Outline**

### **GEOG 3103A: Watershed Hydrology** **January – April 2016**

Instructor: Dr. Jennifer Totten

Office: Loeb A209

Office Hours: Mondays 2:30 – 3:30 p.m. and Wednesdays 1:30 to 2:30 p.m.

E-mail: [jennifer.totten@carleton.ca](mailto:jennifer.totten@carleton.ca) (typically the best way to get in touch with me – I do not answer emails on weekends)

Lectures: \*\*\* Wednesdays 11:35 a.m. 13:25 p.m., Loeb A720

Labs: \*\*\*Tuesday; 14:35 p.m. – 17:25 p.m., Loeb A211

TA: *please check cuLearn the first week of classes.*

Pre-Requisite: GEOG 2013A

### **Course Objectives:**

Hydrology can be defined as the study of the hydrologic cycle: the continuous movement of water from the atmosphere to the surface of the earth, into the surface, through the subsurface, and back to the atmosphere. The objective of this course is for the students to develop a sound understanding of the various components of the hydrological cycle. The knowledge of the functioning of these components and the measurement thereof are very important for monitoring and assessing water availability as a resource. The plan for the semester also includes the analysis of specific hydrological regimes and hydrological extremes. As hydrology is a quantitative science, the students will also acquire practical experience with hydrological data analysis assignments involving calculations and the use of spreadsheets in the lab sessions as well as a winter outdoors field assignment.

### **General areas of study:**

1. Hydrological cycle & world water balance
2. Precipitation
3. Interception
4. Evaporation and Evapotranspiration
5. Infiltration
6. Soil moisture and groundwater hydrology
7. Surface runoff
8. Snow hydrology & Glacier hydrology
9. Urban hydrology
10. Wetlands
11. Extreme hydrological events: floods
12. Water quality and pollution

### **Reading material:**

There is a course pack for this course, available at the University Bookstore. It is the responsibility of each student to familiarize themselves with this material. Material contained in the course pack readings will be included on the final exam. Additional material may be assigned during the term.

Classroom teaching and learning activities, including outlines, lectures, PowerPoint presentations, discussions, posted notes, labs etc., by both instructors and students, are copy protected and remain the intellectual property of their respective author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s). Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s).”

### **Course assessment:**

The assessment for the course will be based on several components:

1. There will be 5 assignments on various aspects of the hydrological cycle. These will comprise 60% of the total grade.
2. A final examination worth 40% of the total grade will be given, which will be made up of both essay and short answer questions.
3. All elements of the course will be marked both for content (e.g. ideas, structure of arguments, research, citations etc.) and presentation (e.g. quality of writing, grammar, spelling, and graphical presentation). When the assignment involves substantial written work such as analyses, discussion, etc., this must be **typed**. **HAND WRITTEN ASSIGNMENTS WILL BE RETURNED WITH A ZERO GRADE.** Electronic submissions will NOT be accepted.

### **Exercise topics:**

- |                                |     |
|--------------------------------|-----|
| 1. Flow and precipitation data | 10% |
| 2. Recurrence intervals        | 10% |
| 3. Field Exercise              | 15% |
| 4. Water use journal           | 10% |
| 5. Storm & flow events         | 15% |

### **Attendance and submission policy for course**

All 5 Labs contribute to your grade. Completion of all labs and the final exam are required for successful completion of the course. Submission dates are important. Lab reports are due to the TA at the **beginning** (first 15 minutes) of the lab on the date specified (see attached schedule). Beyond this time, papers will be considered 1 day late automatically. Assignments will only be accepted for 2 days beyond the due date with a penalty of 5% (of the lab itself) per day, unless prior arrangements have been made. Late papers may be submitted to the Geography Department drop box (Loeb B342). The only exception is for reasons of illness or equivalent circumstances (e.g. bereavement). These types of situations must be fully documented in writing (medical

certificates, accident reports etc.) **within one week** of the assignment due date. If in doubt, please come and see me.

Unless otherwise specified, group work is not acceptable. The TA will be returning the assignments in the lab periods, and providing feedback at that time. If you have any questions about the grading, please see your TA, or come and see me.

Standing in this course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean.

### **Academic Integrity & various offences**

Instructional offences include among other activities cheating, contravening examination regulations, plagiarism, submitting similar work in 2 or more courses without prior permission, and disrupting classes. Conduct offenses apply in areas of discrimination and sexual harassment. Further information about University regulations which define and regulate these offences is found at: <http://www2.carleton.ca/studentaffairs/academic-integrity>

The University Senate defines plagiarism as “presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one’s own.” This can include:

- reproducing or paraphrasing portions of someone else’s published or unpublished material, regardless of the source, and presenting these as one’s own without proper citation or reference to the original source;
- submitting a take-home examination, essay, laboratory report or other assignment written, in whole or in part, by someone else;
- using ideas or direct, verbatim quotations, or paraphrased material, concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another’s data or research findings;
- failing to acknowledge sources through the use of proper citations when using another’s works and/or failing to use quotation marks;
- handing in "substantially the same piece of work for academic credit more than once without prior written permission of the course instructor in which the submission occurs."

Plagiarism is a serious offence which cannot be resolved directly with the course instructor. A rigorous investigation is conducted by the Office of the Faculty Dean, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of “F” for the course.

### **Academic Accommodation**

You may need special arrangements to meet your academic obligations during the term because of disability, pregnancy or religious obligations. Please review the course outline promptly. For an accommodation request, the processes are as follows.

**Pregnancy obligation:** write to me with any requests for academic accommodation during the 1<sup>st</sup> two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see the Student Guide.

**Religious obligation:** write to me with any requests for academic accommodation during the 1<sup>st</sup> two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see the Student Guide.

**Academic Accommodations** for Students with Disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), Psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairment in mobility, hearing and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation. If you are already registered with PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally scheduled exam.

You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodations at [http://www2/carleton.ca/equity/](http://www2.carleton.ca/equity/)

**Important dates for this term: (Lecture Schedule and Required Readings):**

Note: the dates on which individual lectures are presented may not be exactly as shown.

*Assignment due dates and field work dates are fixed.*

***Please note that on certain weeks, the lecture session will be held during the lab period, and the lab working period will be held during the lecture time slot.***

<b>Jan 5 lab session: no lab this week</b>			
1	Wednesday, January 6	Introduction & the hydrological cycle	Hendricks, M.R. (2010) Introduction to Physical Hydrology. Chapter 1 – pg 1 - 13
<b>Tuesday, Jan 12 lab session: Assignment 1 given, due Jan 26</b>			
2	Wednesday, January 13	Precipitation	Raghunath, H.M. (2006) <i>Hydrology: principles, analysis &amp; design (2<sup>nd</sup> Ed)</i> . Chapter 2 Precipitation Pg. 17 – 59  Knutson, T.R. <i>et al</i> , <u>Tropical cyclones and climate change</u> . Nature Geoscience, 2010; <a href="http://www.aoml.noaa.gov/hrd/Landsea/knutson-et-al-nat-geo.pdf">http://www.aoml.noaa.gov/hrd/Landsea/knutson-et-al-nat-geo.pdf</a>
<b>**Wednesday, Jan 20 lab session: Lab working period, T.A. present to help during your lab period.</b>			
3	<b>**Tuesday</b> , January 19	Interception;  Evaporation & evapotranspiration	Ward, R.C. & Robinson, M (2000). <i>Principles of Hydrology</i> . Chapter 3 Interception Pg. 63 – 89  Maidment, D.R. (ed) (1992) <i>Handbook of Hydrology</i> , Chapter 4 Evaporation. Pg. 4.1 – 4.47
<b>Tuesday Jan 26<sup>th</sup> lab session : Assignment 1 DUE</b> <b>Assignment 2 – given, due Feb 9</b> at start of lab period.			

4	Wednesday, January 27	Evaporation & evapotranspiration - continued  Infiltration	As above  Manning, J.C. (1997). <i>Applied Principles of Hydrology</i> . <u>Chapter 4 Infiltration and soil water</u> Pg. 75 - 104.
<b>**Wednesday Feb 3 lab session :</b> Lab working period, T.A. present to help during your lab period			
5	<b>**Tuesday</b> February 2	Infiltration  Snow Hydrology	As above  Viessman, W. & Lewis, G. (1996). <i>Introduction to Hydrology</i> . <u>Chapter 14 Snow Hydrology</u> - pp. 265 – 271 & 284 - 288.
<b>Tuesday Feb 9 lab session : Assignment 2 DUE</b> <b>Assignment 3 – given, due Feb 23</b> at start of lab period. <b>Snow field assignment – come prepared to work outside for full lab period – dress well!</b>			
6	Wednesday February 10	Snow hydrology – cont'd  Soil moisture & groundwater hydrology	As above  Ward, R.C. (1975) <i>Principles of Hydrology</i> . <u>Chapter 7 Subsurface water – Groundwater</u> Pg. 183 – 231
<b>Feb 14 – 20: Reading Week, no classes or lab sessions</b>			
<b>Tuesday Feb 23 lab session – Assignment 3 DUE</b> <b>Assignment 4 – given, due Mar 8</b> at start of lab period.			
7	Wednesday, February 24	Groundwater hydrology - continued  Surface hydrology	As above  Dingman, S.L. (2002) <i>Physical Hydrology (2<sup>nd</sup> ed)</i> . <u>Chapter 9 Stream response to water-input events</u> – pg. 389 – 435
<b>**Wednesday March 3 lab session:</b> Lab working period, T.A. present to help during lab period			
8	<b>**Tuesday</b> March 2	Surface hydrology  Glacier hydrology	Dingman, S.L. (2002) <i>Physical Hydrology (2<sup>nd</sup> ed)</i> . <u>Chapter 9 Stream response to water-input events</u> – pg. 389 – 435  Fountain, A.G. & Walder, J.S. (1998) <u>Water flow through temperate glaciers</u> . In <i>Reviews of Geophysics</i> , 36:3. Pg. 299 – 328.
<b>Tuesday March 8 lab session: Assignment 4 DUE</b> <b>Assignment 5 given, Due March 30</b> at start of lab period.			
9	Wednesday March 9	Urban Hydrology	MacKenzie, F.B. (1987) <i>Urbanization and the hydrological regime</i> , in <i>Canadian Aquatic Resources</i> (Healey & Wallace, eds.) Dept. of Fisheries & Oceans. Pg. 277 – 292
<b>**Wednesday March 16 lab session:</b> Lab working period, T.A. present to help during lab period			

10	<b>**Tuesday</b> March 15	Drylands  Wetlands	Thomas, D.S.G. (2011) <i>Arid Zone Geomorphology</i> (3 <sup>rd</sup> Ed) <u>Chapter 11 – Runoff generation, overland flow and erosion on hillslopes</u> Pg. 237 – 259  Mitsch W.J. & Gosselink, J.G. (2007) <i>Wetlands</i> , <u>Chapter 4 Hydrology of Wetlands</u> - pp. 67 – 113
<b>Wednesday March 23 lab session : Lab working period, T.A. present to help during lab period</b>			
11	<b>Tuesday</b> March 22	Wetlands – cont'd  Droughts	As above  Newson, M. (1994) <i>Hydrology and the river environment</i> , <u>Chapter 4 Runoff Extremes</u> Pg. 64 – 89
<b>Tuesday March 29 lab session: Assignment 5 DUE at 14:35 pm, official end of lab program</b>			
12	Wednesday March 30	Floods	As above
13	<b>Tuesday</b> April 5	Water quality	Davie, Tim (2002). <i>Fundamentals of Hydrology</i> . <u>Chapter 8 Water Quality</u> Pg. 106 - 129
14	<b>Wednesday</b> April 6	<b>LAST CLASS</b> - Review of Course and Exam format	All reading to date