



UNIVERSITY OF CALGARY  
FACULTY OF SCIENCE  
DEPARTMENT OF GEOSCIENCE  
COURSE OUTLINE  
WINTER 2015

1. **Course:** Geology 607, Advanced Physical Hydrology

Lecture Sections:

L01: Th, 12:30-15:20, ST 125

Instructor, Dr. M. Hayashi, Office ES 278, Tel. No. 403-220-2794, e-mail address, [hayashi@ucalgary.ca](mailto:hayashi@ucalgary.ca),

Office Hours: By appointment

Geoscience Department ES 118, 403-220-5841, [geoscience.ucalgary.ca](http://geoscience.ucalgary.ca), [geoscience@ucalgary.ca](mailto:geoscience@ucalgary.ca)

2. **Prerequisites:** Mathematics 253 or 267 or 277 or 283 or Applied Mathematics 219 and Geography 415 and Geology 401; or consent of the Department. See section 3.5.C in the Faculty of Science section of the online Calendar ([www.ucalgary.ca/pubs/calendar/current/sc-3-5.html](http://www.ucalgary.ca/pubs/calendar/current/sc-3-5.html))

3. **Grading:** The University policy on grading and related matters is described sections [F.1](#) and [F.2](#) of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Assignments (5) 100% (20 % each)

Letter Grade/ Percentage conversions

A+ 96 - 100	C+ 66 - 69
A 90 - 95	C 62 - 65
A- 85 - 90	C- 58 - 61
B+ 80 - 84	D+ 54 - 57
B 75 - 79	D 50 - 53
B- 70 - 74	F 0 - 49

4. **Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is the student's responsibility to familiarize himself/herself with these regulations. See also [Section E.6](#) of the University Calendar

5. **Scheduled out-of-class activities:** Not applicable

6. **Course Materials:** Suggested reading to be announced in the class.

7. **Examination Policy:** Students should also read the Calendar, [Section G](#), on Examinations.

8. **Writing across the curriculum statement:** In this course, the quality of the student's writing in laboratory reports will be a factor in the evaluation of those reports. See also [Section E.2](#) of the University Calendar.

9. **OTHER IMPORTANT INFORMATION FOR STUDENTS:**

(a) **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties.

(b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).

(c) **Academic Accommodation Policy:** Students with documentable disabilities are referred to the following links: Students with Disabilities: <http://www.ucalgary.ca/pubs/calendar/current/b-1.html> [B.1](#) and Student Accessibility Services: <http://www.ucalgary.ca/access/>.

- (d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also <http://www.ucalgary.ca/secretariat/privacy>.
- (f) **Student Union Information:** VP Academic Phone: 220-3911 Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca).  
SU Faculty Rep. Phone: 220-3913 Email: [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca); Student Ombudsman
- (g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.
- (h) **U.S.R.I.:** At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses ([www.ucalgary.ca/usri](http://www.ucalgary.ca/usri)). Your responses make a difference – please participate in USRI Surveys.

Department Approval: Signed Original

Date: December 19, 2014

Associate Dean's Approval for  
Alternate final examination arrangements: Signed Original

Date: December 22, 2014

## **Weekly contents**

### **Week 1: Watershed as a leaky reservoir**

Hydrograph analysis, linear reservoir theory, linear ordinary differential equations (ODE), unit hydrograph approach, convolution integral.

### **Week 2-4: Vadose zone hydrology**

Water retention characteristics, soil water potential, hydraulics of soil water, Richards equation, Green-Ampt infiltration, Philip infiltration, numerical solution of non-linear partial differential equations (PDE).

### **Week 5-6: Soil heat transfer**

Soil thermal property, heat conduction, linear PDE, Fourier transform, complex variables

### **Week 7-10: Evapotranspiration**

Energy balance, aerodynamic resistance and mass transfer approach, Penman-Monteith equation and canopy resistance, eddy covariance method, stochastic processes.

### **Week 11-12: Hillslope hydrology**

Conceptual runoff processes, Dupuit approximation and Boussinesq equation, baseflow recession analysis.

### **Week 13: Watershed hydrology**

Semi-distributed model, distributed model, model parameterization and up-scaling.