



COURSE OUTLINE

1. **Course:** GLGY 663, (Phys 663)Applications of Stable Isotopes - Winter 2019

Lecture 01: R 16:00 - 17:50 in ST 126

Instructor	Email	Phone	Office	Hours
Dr. Bernhard Mayer	bmayer@ucalgary.ca	403 220-5389	ES 506A	Thursdays 15:00 to 15:45

For a listing of all lab sections corresponding with this course, please see the following link:

http://geoscience.ucalgary.ca/geoscience_info/courses/w16

Course Description

The aim of this course is to provide a thorough background in stable isotope hydrology and geochemistry and hence an understanding of the potential and the limitations of the application of stable isotope techniques in Hydrology, Geology, and Environmental Sciences.

This course is accompanied by up to 9 assignments handed out during class with a completion deadline at the beginning of the next lecture (unless otherwise announced).

The topics covered in the course are given in the table below. This is intended as a general guideline and the schedule of topics may change slightly as the course progresses.

Week	Dates	Lecture topic(s)	Assignments & Labs
1	January 10	Introduction (discussion of course requirements, lecture times, literature, project proposals etc.), Fundamentals, Terminology, Definitions, Isotope Fractionation, Standards, Measurements; time permitting a short visit to Isotope Science Laboratory (ES 513) may follow;	Assignment 1
2	January 17	Introduction to Stable Isotopes in the Hydrological Cycle: Ocean water, precipitation	Assignment 2
3	January 24	No lecture	
4	January 31	Hydrogen and oxygen isotopes in the water cycle: more precipitation, glaciers	Assignment 3
5	February 7	Hydrogen and oxygen isotopes in the water cycle: seepage water, groundwater, surface water, etc.	Assignment 4
6	February 14	Oxygen isotopes in the lithosphere & biosphere: applications to studying paleoclimate	Assignment 5
7		Term break (no lecture)	
8	February 28	Midterm Examination	
9	March 7	Carbon isotopes and the global carbon cycle: atmosphere and biosphere	Assignment 6
10	March 14	Carbon isotopes and the global carbon cycle: hydrosphere and lithosphere (incl. oil, gas)	Assignment 7
11	March 21	Nitrogen isotopes and the global nitrogen cycle: atmosphere, biosphere, pedosphere, and hydrosphere	Assignment 8
12	March 28	Sulfur isotopes and the global sulfur cycle: atmosphere, biosphere, pedosphere, lithosphere, and hydrosphere	Assignment 9
13	April 4	Metal isotopes or spare lecture (if required)	
14	April 11	Submission of final project reports to: bmayer@ucalgary.ca	
	tbd	Final Exam (scheduled by the Registrar's Office)	

Course Site:

D2L: GLGY 663 L01-(Winter 2019)-(Phys 663)Applications of Stable Isotopes

Note: Students must use their U of C account for all course correspondence.

2. Requisites:

See section [3.5.C](#) in the Faculty of Science section of the online Calendar.

Prerequisite(s):

Consent of the Department. Also known as: (Physics 663)

3. Grading:

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

Component(s)	Weighting %
Independent Project	25
Assignments	15
Midterm Examination	25
Final Examination	35

The Midterm and Final examinations are intended to test for comprehension of the material, not memorization of definitions and formulas. Questions will focus on explaining concepts and/or making simple calculations and/or drawing concepts/diagrams.

A passing grade on the final (lab) exam is necessary to pass the course as a whole.

This course is accompanied by a lab sessions that will be conducted as an independent project. Topics for independent study projects will be assigned to individual students. Most projects will require several hours of laboratory work in the UofC Isotope Science Laboratory (ES 513). Project results must be summarized in a short report (max. 5 pages) describing objective, methods, results, discussion and conclusions of the study. The final grade for the independent project will be determined based on the written report.

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	95 %	90 %	85 %	80%	75%	70 %	65 %	60%	55%	50 %	45 %

This course has a registrar scheduled final exam.

4. Missed Components Of Term Work:

In the event that a student misses the midterm or any course work due to illness, supporting documentation, such as a medical note or a statutory declaration will be required (see [Section N.1](#); for more information regarding the use of statutory declaration/medical notes, see [FAQ](#)). Absences must be reported within 48 hrs.

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 themselves with these regulations. See also [Section E.3](#) of the University Calendar.

5. **Scheduled Out-of-Class Activities:**

There are no scheduled out of class activities for this course.

REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY . If you have a clash with this out-of-class-time-activity, please inform your instructor as soon as possible so that alternative arrangements may be made for you.

6. **Course Materials:**

There is no textbook, which covers all topics presented in this course. Hence, we will rely mainly on the lecture notes and it is not essential to buy a textbook for this course. However, graduate students with a strong isotope component in their thesis research may want to invest in one of the following excellent books:

For Hydro(geo)logists: I. Clark & P. Fritz (1997): Environmental Isotopes in Hydrogeology. Lewis Publishers, Boca Raton – New York (US\$ 75).

For Geologists: Sharp, Z. (2007): Stable Isotope Geochemistry. Pearson Prentice Hall, Upper Saddle River NJ (~\$100).

For Physicists: Criss, R. E. (1999): Principles of Stable Isotope Distribution. Oxford University Press New York (US\$ 69).

For Ecologists: Fry, B. (2006): Stable Isotope Ecology. Springer, New York (\$60)

Some of these books are on reserve in the Gallagher Library throughout the winter term. Other books of potential interest are:

For Hydro(geo)logists:

Mook, W.G. (2000): Environmental Isotopes in the Hydrological Cycle: Principles and Applications. – International Hydrological Programme IHP-V, Technical Documents in Hydrology, No 39 Vol. 1-6: also available on the internet at: <http://www.iaea.org/programmes/ripc/ih/volumes/volumes.htm>

C. Kendall & J. J. McDonnell (1998): Isotope Tracers in Catchment Hydrology. Elsevier Science BV, ISBN 0-444-50155-X (US\$ 80)

Aggarwal, P., Gat, J. & Froehlich, K. F. O. (2005): Isotopes in the Water Cycle: Past, Present & Future of a Developing Science. Springer, Dordrecht, Netherlands.

For Geologists:

Kyser, K. (1987): Short Course in Stable Isotope Geochemistry of Low Temperature Fluids (volume 13). Mineralogical Association of Canada (CDN\$ 22).

Valley, J. W. & Cole, D. R.(2001) Stable Isotope Geochemistry. Reviews in Mineralogy & Geochemistry, Volume 43, 662 pages. Mineralogical Society of America, Washington DC. (~\$50).

Other books:

J. Hoefs (1997): Stable Isotope Geochemistry (4th completely revised, updated, and enlarged edition). Springer, Berlin (US\$ 60).

De Groot, P. A. (2004): Handbook of Stable Isotope Analytical Techniques, Vol. I. Elsevier, Amsterdam (ISBN: 0 444 51114 8).

Online Course Components: None

7. **Examination Policy:**

No aids are allowed on tests or examinations.

Exams will be closed book, closed notes, but a calculator will be allowed.

Students should also read the Calendar, [Section G](#), on Examinations.

8. **Approved Mandatory And Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course.

9. **Writing Across The Curriculum Statement:**

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section [E.2](#) of the University Calendar.

In this course, the quality of the student's writing in laboratory reports will be a factor in the evaluation of those reports.

10. **Human Studies Statement:**

Students will not participate as subjects or researchers in human studies.

See also [Section E.5](#) of the University Calendar.

11. **Reappraisal Of Grades:**

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See [Section I.3](#) of the University Calendar.

a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **15 days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall immediately submit the Reappraisal of Graded Term work form to the department in which the course is offered. The department will arrange for a re-assessment of the work if, and only if, the student has sufficient academic grounds. See sections [I.1](#) and [I.2](#) of the University Calendar

b. **Final Exam:** The student shall submit the request to Enrolment Services. See [Section I.3](#) of the University Calendar.

12. **Other Important Information For Students:**

a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, [Mental Health Services Website](#)) and the Campus Mental Health Strategy website ([Mental Health](#)).

b. **SU Wellness Center:** The Students Union Wellness Centre provides health and wellness support for students including information and counselling on physical health, mental health and nutrition. For more information, see www.ucalgary.ca/wellnesscentre or call [403-210-9355](tel:403-210-9355).

c. **Sexual Violence:** The University of Calgary is committed to fostering a safe, productive learning environment. The Sexual Violence Policy (<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>) is a fundamental element in creating and sustaining a safer campus environment for all community members. We understand that sexual violence can undermine students' academic success and we encourage students who have experienced some form of sexual misconduct to talk to someone about their experience, so they can get the support they need. The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email (svsa@ucalgary.ca) or phone at [403-220-2208](tel:403-220-2208).

d. **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. Examples of academic misconduct may include: submitting or presenting work as if it were the student's own work when it is not; submitting or presenting work in one course which has also

been submitted in another course without the instructor's permission; collaborating in whole or in part without prior agreement of the instructor; borrowing experimental values from others without the instructor's approval; falsification/ fabrication of experimental values in a report. **These are only examples.**

- e. **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- f. **Academic Accommodation Policy:** Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the procedure for accommodations for students with disabilities available at [procedure-for-accommodations-for-students-with-disabilities.pdf](#).

Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Sr. Instructor of the Department of Geoscience, Dr. Rudi Meyer by email rmeyer@ucalgary.ca or phone 403-210-7848. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See [Section E.4](#) of the University Calendar.
- g. **Safewalk:** Campus Security will escort individuals day or night (See the [Campus Safewalk](#) website). Call [403-220-5333](tel:403-220-5333) for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- h. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPPA). 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 [Legal Services](#) website.
- i. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](tel:403-220-3911) Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: sciencerep@su.ucalgary.ca. Student Ombudsman, Email: suvpaca@ucalgary.ca.
- j. **Internet and Electronic Device Information:** Unless instructed otherwise, cell phones should be turned off during class. All communication with other individuals via laptop, tablet, smart phone or other device is prohibited during class unless specifically permitted by the instructor. Students that violate this policy may be asked to leave the classroom. Repeated violations may result in a charge of misconduct.
- k. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction ([USRI](#)) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.
- l. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or [non-academic misconduct](#), in addition to any other remedies available at law.

Department Approval:

Electronically Approved

Date: 2019-01-09 13:11