

UNIVERSITY OF CALGARY
DEPARTMENT OF PHYSICS AND ASTRONOMY
COURSE OUTLINE

1. **Course:** PHYSICS 663, Application of Stable Isotopes

Lecture Sections:

L01: Wednesday, 16:00-17:50, ST 025; Instructor: Dr. Bernhard Mayer Office: ES 506A Tel. No. 220 5389 e-mail address: bmayer@ucalgary.ca, Office Hours: Wednesday: 15:00-15:45

The course website can be found on blackboard (<http://blackboard.ucalgary.ca>).

Departmental Office: ES118, 403-220-5184, geosci@ucalgary.ca

2. **Prerequisites:** Consent by the department (see <http://www.ucalgary.ca/pubs/calendar/current/geology.html#9734>)

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:

Lab Assignments (10)	25%	
Midterm test	30%	(October 23, 2013)
Final Lab Examination	45%	(December 4, 2013)

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

Each piece of work (assignment, laboratory report, midterm test or final examination) submitted by the student will be assigned a percentage score. The student's average percentage score for the various components 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, bearing in mind that an F grade will result if the student does not pass the Final Examination. The conversion between course percentage and letter grade is given below.

Letter Grade	Percent	Letter Grade	Percent
A+	97-100	C+	67-70
A	91-96	C	63-66
A-	86-90	C-	59-62
B+	81-85	D+	55-58
B	76-80	D	50-54
B-	71-75	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:** None.

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.laee.org/programmes/ihp/vol/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. 1. Elsevier, Amsterdam (ISBN: 0 444 51114 8).

The course blackboard site contains the lecture material and the lab assignments, as well as other resource material that you might find useful. Students are advised that reading the course blackboard page is not a substitute for attendance at lectures. The lectures provide an interactive environment that embellishes on, and provides a context for, the material in the textbook, whereas blackboard is a live site that allows for tailoring and updating of the course material during the term.

7. **Examination Policy:** Calculators and rulers are permitted, but no textbooks or course notes. Students should also read the Calendar, Section G, on Examinations.

8. **Approved Mandatory and Optional Course Supplemental Fees:** None

9. **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.

10. **Human studies statement:** Students in the course are not expected to participate as subjects or researchers. See also Section E.5 of the University Calendar.

11. OTHER IMPORTANT INFORMATION FOR STUDENTS:

(a) **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: Calendar entry on students with disabilities and Student Accessibility Services.

(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 (FOIP). 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>.

UNIVERSITY OF CALGARY
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COURSE SYLLABUS

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2. **Prerequisites:** Consent by the department (see <http://www.ucalgary.ca/pubs/calendar/current/geology.html#9734>)

3. **Syllabus:** 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 a number of assignment and potentially some lab demonstrations scheduled on September 25 during lecture hours.

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	September 11	Introduction (discussion of course requirements, lecture times, literature, project proposals etc.), Fundamentals, Terminology, Definitions, Isotope Fractionation, Standards, Measurements, followed by visit to Isotope Science Laboratory	Assignment 1
2	September 18	Introduction to Stable Isotopes in the Hydrological Cycle: Ocean water, precipitation	Assignment 2
3	September 25	No lecture but lab demo water isotopes	Lab demo
4	October 2	Hydrogen and oxygen isotopes in the water cycle: more precipitation, glaciers	Assignment 3
5	October 9	Hydrogen and oxygen isotopes in the water cycle: seepage water, groundwater, surface water, etc	Assignment 4
6	October 16	Oxygen isotopes in the lithosphere & biosphere: application to studying paleoclimate	Assignment 5
7	October 23	Midterm Examination	
8	October 30	Carbon isotopes and the global carbon cycle: atmosphere and biosphere	Assignment 6
9	November 6	Carbon isotopes and the global carbon cycle: hydrosphere and lithosphere (incl. oil, gas)	Assignment 7
10	November 13	Nitrogen isotopes and the global nitrogen cycle: atmosphere, biosphere, pedosphere, and hydrosphere	Assignment 8
11	November 20	Sulfur isotopes and the global sulfur cycle: atmosphere, biosphere, pedosphere, lithosphere, and hydrosphere	Assignment 9
12	November 27	Spare lecture (if required)	
13	December 4	Final Lab Exam	

(f) **Student Union Information:** VP Academic Phone: 220-3911 Email: suypaca@ucalgary.ca SU Faculty Rep. Phone: 220-3913 Email: 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.

