

**University of Nevada, Las Vegas
Department of Geoscience**

GEOL 708 Radiogenic Isotope Geochemistry Spring 2016

8:30-9:45am Tuesday and Thursday LFG 202

Textbook: Radiogenic Isotope Geology, by Alan P. Dickin, 2nd edition, 2005

Radiogenic isotope geochemistry is the study of how we use the isotopic composition of Earth materials as a tracer of the paths and processes which produced them. This is a simple and broad definition, however, the detailed applications are very numerous and always evolving. Many novel approaches and isotopic systems have been discovered in the past 5-10 years that are not yet in textbooks. Accordingly, we will supplement reading of basic material from the textbook with journal articles which outline specific new applications and ideas. Since this course is a graduate class at the 700 level we will try to accommodate subject material which is appropriate to the students enrolled in the class, thus this syllabus has been designed to be, and you should consider it to be, somewhat flexible. Note that this class is not meant to cover geochronology, which is the other major application of radiogenic isotopes.

The course will consist of lectures, reading from the text, and assigned reading from journal articles. Following this page is a schedule of the lecture material we will cover and the dates for the exams. Grades will be assigned based on your performance as follows:

- Tests, consisting of two regular exams and a comprehensive final
- Classroom participation

These areas will count as follows towards your grade:

Tests - 100%

Participation – will push you up, or pull you down, if you are marginal between letter grades

The three scheduled tests will count equally.

GEOL 708 Radiogenic Isotope Geochemistry Spring 2016 Course Outline

Dates

Material Covered

January 19/21 - Introduction to GEOL 708, nuclear structure of atoms, nuclear systematics

January 26/28 - Chart of the nuclides, radioactive decay mechanisms

February 2/4 – Equations governing decay, mixing of two isotopic systems

February 9/11 – Mass spectrometry – measurement of isotopic composition

February 16/18 – Trace element partitioning

February 23/25 - Trace element partitioning , Test #1 (Thursday)

March 1/3 – Isotope geochemistry of the mantle

March 8/10 - Isotope geochemistry of the mantle, basalts, mantle models

March 15/17 – Isotope geochemistry of subduction zone magmas

March 22/24 – No Classes - Spring Break Week

March 29/31 - Isotope geochemistry of subduction zone magmas

April 5/7 - Isotope geochemistry of the continental crust, Test #2 (Thursday)

April 12/14 - Isotope geochemistry of the continental crust

April 19/21 – Isotope geochemistry of waters and sedimentary rocks

April 26/28 - Isotope geochemistry of rivers and oceans

May 3/5 – Extinct radionuclides and evolution of the solar system

May 12 - Final Exam 8:00-10:00am - Comprehensive

UNLV Course Syllabus Information

GEOL 708 – Radiogenic Isotope Geochemistry (3 credits)

1) Course Learning / Outcome Objectives

Upon completion of this course students should have knowledge of:

1. Nuclear systematics and isotopic decay.
2. Basic mass spectrometry.
3. Isotopic composition of Earth's mantle.
4. Isotopic composition of basalts.
5. Isotopic composition of the continental crust.
6. Isotopic composition of the hydrosphere
7. Isotopic composition of sedimentary and metamorphic rocks
8. Current/new applications of radiogenic isotopes.

2) **Assessment** of these learning/outcome objectives will be based on lecture exams as well as classroom preparedness and participation.

3) The **purpose** of this course is to provide a comprehensive understanding of radiogenic isotope geochemistry. The course satisfies the UNLV general science requirement. Students are responsible for attending class, maintaining notes, and reading assigned material in the textbook as well as journal articles assigned. Examinations will be short answer. Departmental policy precludes makeup exams, however, with prior notification and approval exams may be taken early.

4) Further Information:

Academic Misconduct — Academic integrity is a legitimate concern for every member of the campus community; all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility and professionalism. By choosing to join the UNLV community, students accept the expectations of the Student Academic Misconduct Policy and are encouraged when faced with choices to always take the ethical path. Students enrolling in UNLV assume the obligation to conduct themselves in a manner compatible with UNLV's function as an educational institution. An example of academic misconduct is plagiarism. Plagiarism is using the words or ideas of another, from the Internet or any source, without proper citation of the sources. See the Student Academic Misconduct Policy (approved December 9, 2005) located at: <https://www.unlv.edu/studentconduct/student-conduct>.

Copyright — The University requires all members of the University Community to familiarize themselves **with** and to follow copyright and fair use requirements. **You are individually and solely responsible for violations of copyright and fair use laws. The university will neither protect nor defend you nor assume any responsibility for employee or student violations of fair use laws.** Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. Additional information can be found at: <http://www.unlv.edu/provost/copyright>.

Disability Resource Center (DRC) — The UNLV Disability Resource Center (SSC-A 143, <http://drc.unlv.edu/>, 702-895-0866) provides resources for students with disabilities. If you feel that you have a disability, please make an appointment with a Disabilities Specialist at the DRC to discuss what options may be available to you. If you are registered with the UNLV Disability Resource Center, bring your Academic Accommodation Plan from the DRC to the instructor during office

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hours so that you may work together to develop strategies for implementing the accommodations to meet both your needs and the requirements of the course. Any information you provide is private and will be treated as such. To maintain the confidentiality of your request, please do not approach the instructor in front of others to discuss your accommodation needs.

Religious Holidays Policy — Any student missing class quizzes, examinations, or any other class or lab work because of observance of religious holidays shall be given an opportunity during that semester to make up missed work. The make-up will apply to the religious holiday absence only. It shall be the responsibility of the student to notify the instructor within the first 14 calendar days of the course for fall and spring courses (excepting modular courses), or within the first 7 calendar days of the course for summer and modular courses, of his or her intention to participate in religious holidays which do not fall on state holidays or periods of class recess. For additional information, please visit: <http://catalog.unlv.edu/content.php?catoid=6&navoid=531>.

Transparency in Learning and Teaching — The University encourages application of the transparency method of constructing assignments for student success. Please see these two links for further information:

<https://www.unlv.edu/provost/teachingandlearning>

<https://www.unlv.edu/provost/transparency>

Incomplete Grades — The grade of I—Incomplete—can be granted when a student has satisfactorily completed three-fourths of course work for that semester/session but for reason(s) beyond the student's control, and acceptable to the instructor, cannot complete the last part of the course, and the instructor believes that the student can finish the course without repeating it. The incomplete work must be made up before the end of the following regular semester for undergraduate courses. Graduate students receiving "I" grades in 500-, 600-, or 700-level courses have up to one calendar year to complete the work, at the discretion of the instructor. If course requirements are not completed within the time indicated, a grade of F will be recorded and the GPA will be adjusted accordingly. Students who are fulfilling an Incomplete do not register for the course but make individual arrangements with the instructor who assigned the I grade.

Tutoring and Coaching — The Academic Success Center (ASC) provides tutoring, academic success coaching and other academic assistance for all UNLV undergraduate students. For information regarding tutoring subjects, tutoring times, and other ASC programs and services, visit <http://www.unlv.edu/asc> or call 702-895- 3177. The ASC building is located across from the Student Services Complex (SSC). Academic success coaching is located on the second floor of the SSC (ASC Coaching Spot). Drop-in tutoring is located on the second floor of the Lied Library and College of Engineering TEB second floor.

UNLV Writing Center — One-on-one or small group assistance with writing is available free of charge to UNLV students at the Writing Center, located in CDC-3-301. Although walk-in consultations are sometimes available, students with appointments will receive priority assistance. Appointments may be made in person or by calling 702-895-3908. The student's Rebel ID Card, a copy of the assignment (if possible), and two copies of any writing to be reviewed are requested for the consultation. More information can be found at: <http://writingcenter.unlv.edu/>.

Rebelmail — By policy, faculty and staff should e-mail students' Rebelmail accounts only. Rebelmail is UNLV's official e-mail system for students. It is one of the primary ways students receive official university communication such as information about deadlines, major campus events, and announcements. All UNLV students receive a Rebelmail account after they have been admitted to the university. Students' e-mail prefixes are listed on class rosters. The suffix is always @unlv.nevada.edu. **Emailing within WebCampus is acceptable.**

Library Resources — Students may consult with a librarian on research needs. For this class, the subject librarian is https://www.library.unlv.edu/contact/librarians_by_subject. UNLV Libraries provides resources to support students' access to information. Discovery, access, and use of information are vital skills for academic work and for successful post-college life. Access library resources and ask questions at <https://www.library.unlv.edu/>.

Final Examinations — The University requires that final exams given at the end of a course occur at the time and on the day specified in the final exam schedule. See the schedule at: <http://www.unlv.edu/registrar/calendars>.