

University of South Carolina
College of Arts and Sciences
Department of Earth and Ocean Sciences

GEOL 520 – ISOTOPE GEOCHEMISTRY
Syllabus

Instructor: Dr. Michael Bizimis

Contact information

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Office Hours: 11:00-12:00 pm, Tuesday – Thursday, or right after class.

NOTE: IF you email me a question related to class, please put in front of your message subject “GEOL 520”. This ensures a quicker response.

Classes Meets: Tuesday, and Thursday 12:30PM- 1:45PM, EWSC 209

Course Description: Understand what are isotopes and their uses in geosciences. The course will cover the following subjects:

- Nucleosynthesis, stellar formation, cosmic and solar abundance of the elements.
- Modes of Radioactive decay.
- The decay equation and the principle of parent-daughter geochronology.
- The isotope systems: Rb-Sr, Sm-Nd, U-Th-Pb, Lu-Hf, Re-Pt-Os, K-Ar, Ar-Ar.
- Geochronological applications.
- Terrestrial elemental reservoirs, large scale processes and the chemical differentiation of the planet.
- Use of isotopes as tracers for source composition.
- Short-lived extinct radionuclides (e.g. Hf-W, Al-Mg, Fe-Ni) and the time scales of the solar system formation and accretion of the earth.

Textbook: Not required but highly recommended. Several options are available:

Alan P. Dickin: Radiogenic Isotope Geology

Gunter Faure and Teresa M. Mensing: Isotopes: Principles and Applications

Francis Albarede: Geochemistry.

Nuclides and isotopes (Booklet: published by Lockheed Martin, 16th edition, available from www.ChartOfNuclides.com).

Other resources: Geochemistry, by William M. White (Cornel) (Textbook available on-line):

<http://www.geo.cornell.edu/geology/classes/geo455/Chapters.HTML>

Learning Outcomes: Upon the completion of this course you should be able to:

- Understand the different mechanisms of nucleosynthesis, and how they relate to the composition of the earth and solar system.
- Understand the different mechanisms of radioactive decay and their use in geochronology.
- Gather age information from different radioactive isotopic systems.
- Use extinct radionuclides to determine the different time scales of solar system formation and Earth differentiation.
- Evaluate and select the appropriate isotopic systems to date different types of rocks.
- Compare the isotopic compositions of different terrestrial reservoirs and evaluate parent – daughter fractionations with time and their implications for planetary differentiation and elemental recycling in the earth.
- Use of radiogenic isotopes as present-day tracers of processes (i.e. reservoir mixing).

Grading Policy: There will be 4 take home exams, each counting for 20% of your grade (25% for the undergraduates). The graduate students are also expected to give a 12-15 minute presentation on a topic chosen after consultation with the instructor. The chosen topic will also be the basis for discussion following the talk. The presentation will count for 15% of the grade and will be evaluated based on AGU standards for student presentations. The subject of the talk and one or two key papers will be given to the class in advance so the rest of the students can participate and ask questions. Overall participation in the class will account for the final 5% of the grade. Exams will be given on a Thursday to be returned the following Tuesday before class, no exceptions (unless consulted with the instructor).

This class abides by the **academic dishonesty** policy of USC that I know you all read and agree with completely as written.

<http://www.sa.sc.edu/carolinacommunity/>

<http://www.sa.sc.edu/carolinacommunity/housing.htm#Academic%20Responsibility>

American with Disabilities Acts (ADA) statement: This University and its faculty will make every effort to accommodate any and all students with special needs.

<http://www.sa.sc.edu/carolinacommunity/stdev.htm#Disability%20Discrimination>

Attendance Policy: None.