Instructor: Dr. Michael Bizimis

Contact information
Office: PSC 519
Phone: (803) 777-5565
Email: mbizimis@geol.sc.edu (best way to get in touch with me)
Office Hours: catch me after class, or send me an email for appointment.

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: T, Th 11:40-12:55, EWSC 209

Course Description: The use of isotopic characterization of terrestrial materials plays an increasing role in understanding earth processes, from large-scale plate tectonics and mantle convection problems, to use as tracers of environmental investigations and biological applications. The goal of this course is to provide and understand isotope geochemistry and the use of isotopes 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 radiogenic isotope systems: Rb-Sr, Sm-Nd, U-Th-Pb, Lu-Hf, Re-Pt-Os, K-Ar, Ar-Ar.
- Geochronological applications.
- Terrestrial elemental reservoirs, processes of their formation and chemical differentiation of the planet.
- Use of isotopes as tracers for mantle source composition.
- Analytical techniques.
- Short-lived extinct radionuclides (e.g. Sm146-Nd142, Hf-W, Al-Mg, Fe-Ni) and the time scales of the solar system formation and accretion of the earth.
- “Non-traditional” isotope systems (Fe, Mg, B, Li, etc.) and their uses in geosciences.

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.
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.
- Generate 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).
- Use of Stable isotope systems as tracers of processes.

**Grading Policy:** There will be 6 take home exams. The exams will be weighted equally and will account for 80% of your grade. The exams will be different for the graduate and undergraduate students. The students will also give a 15-minute presentation on a topic related to the use of isotopes in geosciences that will be chosen after consultation with the instructor. The chosen topic will also be the basis for discussion following the presentation. 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.

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/carinacommunity/
http://www.sa.sc.edu/carinacommunity/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/carinacommunity/stdev.htm#Disability%20 Discrimination

**Attendance Policy:** None.