ERTH 4820A- Research Methods in Earth Sciences

Fall 2021

COURSE DECRIPTION:
Communicating research results; state-of-the-art analytical techniques in elemental and isotopic analyses; data acquisition, evaluation and interpretation.

Prerequisite(s): Third-year standing in Earth Sciences programs.

Virtual lectures, seminars, or laboratories three hours a week. May also include virtual tours of other research institutes.

OBJECTIVES:
To help students gain (1) knowledge of advanced analytical methods and hands-on experiences pertaining to the elemental and isotopic analyses, (2) understanding of data evaluation and interpretation, (3) skills in effectively using library resources, in writing research proposals and in communicating research results.

ASSIGNMENTS:
Abstract- to write an abstract for a given journal paper.
Proposal- to write a proposal to obtain fund to support a research project.
Library assignment- complete a take-home exercise in searching, citing and evaluating the journal articles.
Virtual Lab tour reports- to summarize your virtual tour of AMS, IRMS and ICP-MS facilities, focusing on the principles and capabilities of IRMS, AMS, ICP-MS and their potential applications to your research project.
Elemental and isotopic data acquisition, reduction and evaluation- to acquire isotopic data using a multi-collector mass spectrometer, and mineral compositions using an electron microprobe; to evaluate the isotope ratio data; to calculate the mineral formulas based on their oxide weight percentages.
Virtual oral presentation (10 minutes) – to present the major points of a selected paper and your review of the paper. A paper can be chosen according to your choice of a sub-discipline in the earth sciences.

MARKS ASSIGNED:
Attendance and participation 10%
Abstract 10%
Proposal 10%
Library 10%
Virtual lab tour reports 10%
Data reduction and evaluation 30%
Oral presentation 20%

Note: The instructor is required to report all incidents (or suspected incidents) of plagiarism to the Dean.

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Classes: online, 6:05 pm – 8:55 pm, Wednesdays
Note: length of class time will vary depending on topic and activity (i.e. some lectures will finish before the allotted time; seminars will use the full period).

COURSE REQUIREMENTS:
• **Check CU Brightspace**. It is the student's responsibility to check CU **Brightspace** for notices and course materials.
• **Attendance and class participation is mandatory**. It is expected that students prepare for classes (e.g. reading, research, preparation of critiques) and participate in classes. Class participation includes contributions of critical reviews and questions about reading assignments, questions and/debate about lecture or seminar material, and presentation of assigned papers in a seminar setting.

AUDITORS are expected to register in the course, do the readings & participate in the course. Attendance is mandatory.

RECOMMENDED READING

1. *John C. Davis, 2002, Statistics and Data Analysis in Geology, third edition: John Wiley & Sons*
2. *John H. Schuenemeyer and Lawrence J. Drew, 2011, Statistics for Earth and Environmental Scientists, John Wiley and Sons.*
3. *Francis Albarède, 1995, Introduction to Geochemical Modeling, Cambridge University Press.*
4. *Peter Copeland, 2012, Communicating Rocks: Writing, Speaking and Thinking about Geology, Pearson, Boston.*

Shuangquan Zhang's virtual office hours: Thursdays 6:30 pm – 9:30 pm, by Zoom or BigBlueButton, appointments via email shuangquan.zhang@carleton.ca

ACADEMIC INTEGRITY
It is your responsibility to review Carleton's policy on Academic Integrity from Section 10 of the Calendar.
https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/academic-integrity-and-offenses-of-conduct/#academic-integrity-policy

PLAGIARISM
The instructor is required to report all incidents (or suspected incidents) of plagiarism to the Dean. **All work handed in must be your own.** Plagiarism and cheating are viewed as being particularly serious and the sanctions imposed are accordingly severe. Students are expected to familiarize themselves with and follow the Carleton University Student Academic Integrity Policy. The Policy is strictly enforced and is binding on all students. Plagiarism and cheating – presenting another's ideas, arguments, words or images as your own, using unauthorized material, misrepresentation, fabricating or misrepresenting research data, unauthorized co-operation or collaboration or completing work for another student – weaken the quality of the graduate degree. Academic dishonesty in any form will not be tolerated. Students who infringe the Policy may be subject to one of several

penalties including: expulsion; suspension from all studies at Carleton; suspension from full-time studies; a refusal of permission to continue or to register in a specific degree program; academic probation; or a grade of Failure in the course.

Requests for Academic Accommodations
You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

Pregnancy obligation
Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: **carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf**

Religious obligation
Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: **carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf**

Academic Accommodations for Students with Disabilities
If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. **carleton.ca/pmc**

Survivors of Sexual Violence
As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and is survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: **carleton.ca/sexual-violence-support**

Accommodation for Student Activities
Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or

as soon as possible after the need for accommodation is known to exist. **https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf**

Missed Examinations and Assignments

Students with conflicts for any examination must have a note from an employer or a sports coach in order to write the exam at another date. Unless caused by illness, all conflicts MUST be reported to the instructor PRIOR to the exam date. If a lab is missed, a student may make it up the following week outside normal lab time. Because of COVID restrictions it is not possible to extend the deferral past a week. In this event alternative arrangements to make up the grade must be made. In the case of a less serious illness (cold, flu), I require that you inform me by e-mail immediately, and we will schedule a deferred exam as soon as possible. In the case of a serious illness, see **http://carleton.ca/registrar/special-requests/deferral/** for the rules concerning deferral of an exam or assignment, and contact me as soon as possible.

For more information on academic accommodation, please contact the departmental administrator or visit: **students.carleton.ca/course-outline**

LEARNING OUTCOMES

After successfully completing this course, you will obtain the skills and knowledge sets in the lectures and lab sessions, described as follows:

Know how to write an effective abstract in a research paper;

Know major types of research proposals and how to construct an effective research proposal;

Effectively organize and orally present the research results;

Know and effectively use relevant search tools when citing and critically reviewing other's work;

Choose suitable methods to acquire isotopic and elemental data by understanding the methods' principles and capabilities;

Critically appreciate the isotopic and elemental data by knowing the uncertainties of the data and the mathematical processes involved in the data reduction.