

Course Outline

Please take 10 min. to read through this outline. There is important information in here that will help you throughout the course.

Calendar Description

This course will examine different ways of knowing and modes of research design relevant for interdisciplinary environmental research. Students will also be introduced to an array of quantitative and qualitative research methods in the natural and social sciences and will explore methods relevant to their research through class discussions and assignments.

Eligible Students

This course is intended for graduate students in the School of Environment, Resources and Sustainability.

Course Goals

This course will provide an examination of different modes and methods of analysis used in research. A broad overview of methodological approaches will be provided. ERS students are incredibly diverse in their research interests and associated research methods. Exploring all the potential research methods in detail would require several years worth of courses. Therefore, this course is intended as a survey of potential research methods in the natural and social sciences including quantitative and qualitative approaches. Students will have the opportunity to explore research methods relevant to their research interests in-depth through the class assignments. Overall, it is my goal to provide you some tools to think clearly and critically about research, and allow you the opportunity to pursue in-depth study of research methods relevant to your thesis research or other area of interest.

Meetings

We will meet weekly on Mondays from 11:30 am to no later than 2:20 pm in EV3 3406. I have planned course activities each day into approximately two time periods. The first half will run from 11:30 am to 12:50 pm and the second half from 1:00 pm to 2:20 pm. However, these times are approximate.

Instructor Contact

The course instructor is Dr. Brad Fedy, a faculty member in UW's School of Environment, Resources and Sustainability. Office number: EV2-2024; phone: 591-888-4567 ext. 32706; e-mail: bfedy@uwaterloo.ca. Winter 2018 office hours are Mondays from 3:00 pm to 4:00 pm. Office hours are opportunities for students to drop-in on a first-come-first-served basis. If you would like to meet and cannot make office hours, please send me an e-mail and we can find an alternative, mutually agreeable, time to meet. I believe that high-quality work requires focus. For me to obtain that focus, I need to limit distractions. E-mail is probably the single greatest distraction in my professional life. I tend to only check my e-mail twice a day and receive an average of 80 e-mails per day during teaching semesters. *Therefore, please expect, at least a 2 day turnaround for an e-mail response from me.* Sometimes it will be quicker, sometimes slower.

Electronic Delivery

The course has a dedicated web page that you can access through UW's LEARN system (<http://learn.uwaterloo.ca>). All course materials will be provided through the site and all assignments will need to be submitted through the site. I will also use the LEARN site to post general messages to the class. I encourage you all to become familiar with the site as soon as possible and to check for updates on the site on a regular basis.

Required Readings

There are a modest number of required readings. These are readings that students are expected to read before coming to a particular class. They are available through the LEARN site.

Assignments

There are 6 assignments - or deliverables - associated with this course, all of which are described in detail below. Three of the assignments revolve around your major Research Methods Assignment and include a proposal, a presentation, and the assignment itself. The other three assignments include a short problem statement and two assignments addressing Research Problem Literature. Rubrics for all assignments will be available via the LEARN site and we will discuss each assignment extensively in class.

- Research Methods Assignment. This project will provide your main focus for the course outside of class times. One of the key skills of becoming an independent researcher is to develop your capacity for self-education. Research methods are constantly growing and changing and in order to stay current - and relevant - it is important for you to be

able to keep up. This assignment challenges you to learn and explore a methodological approach (or suite of approaches) of interest to you. The immersion in your selected topic should provide disproportionately more insight than the summaries I will provide in lecture. I strongly suggest you explore an approach that will be relevant to your thesis. In order to allow adequate amount of time, we will have topics selected near the end of January. I suggest you discuss potential research methods with your advisor. I have also scheduled time during the second half of our class on January 22, 2018 to meet with me and discuss your topic. I have provided a list of potential assignment topics at the end of this document. The list is far from exhaustive. You can approach the assignment either from the method (e.g., I'm really interested in approaches for variable reduction) or the question (e.g., I'm really interested assessing community strategies to respond to climate change). A written report is due at the end of the semester. The exact outline of the report and content will vary by topic but should include:

- Discussion of the types of research questions addressed by the research method
 - Data requirements and format
 - Assumptions, alternatives, costs and benefits of the research method
 - Example studies from relevant peer-reviewed literature (preferably current) exemplifying 'good' and 'questionable' practices using the approach.
 - A preliminary analysis or worked examples in relevant software - if appropriate.
 - Exploration of alternative approaches
- Research Methods Assignment - Proposal. This is a short (e.g., ≤ 2 pages) description of what research method you intend to explore for your Research Methods Assignment. It should include the method, a description of its importance, and an outline for your assignment.
 - Research Methods Assignment - Presentation. Clear communication is key to effective research. Each student will present the method they examined to the class during our last two meetings.
 - Research Problem Literature. For Week 7 and 8 we will use the second half (Part II) of class to discuss and brainstorm the best approaches for addressing several research questions. Students will be provided with the research question the week prior to our discussion. Students are required to find 2 articles (peer-reviewed preferred) relevant to the research problem. Students are required to submit a document containing the full citations for each article, including a brief (1-2 paragraph) summary of the articles relevance to the research problem.

Assessment

- Participation (10%) - Students are expected to participate constructively in all sessions.

- Proposal (10%) - Each student will prepare and submit a (≤ 2 pages) outline of their proposed research methods assignment. This document is due, electronically through the course website, by midnight January 29, 2018.
- Research Problem Statement (5%) - Each student will prepare a short (i.e., 1 paragraph) summary of a research problem. These will be discussed and edited during the second part of class on February 5, 2018. The final version is due by Friday February 9, 2018.
- Assignment (35%) - Each student will prepare and submit a Research Methods Assignment as outlined above. This document is due, electronically through the course website, by midnight April 9, 2018.
- Presentation (20%) - Each student will deliver a 15 min. presentation on their research methods assignment. These presentations will be delivered, in class, on March 26, 2018 and April 2, 2018.
- Research Problem Literature (20%) - Each student will provide 2 documents (1 for each week) summarizing research articles relevant to the Research Problem discussions (outlined above). The first of these will be due by midnight February 25, 2018. The second is due by midnight March 1, 2018.

Academic Integrity

A student is expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) should seek guidance from the course professor, academic advisor, or the Graduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offences and types of penalties, students should refer to Policy 71 - Student Discipline (<http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm>). Students who are unsure what constitutes an academic offence are requested to visit the on-line tutorial (<http://www.lib.uwaterloo.ca/ait/>).

Within ENV, those committing academic offences (e.g., cheating, plagiarism) will be placed on disciplinary probation and will be subject to penalties which may include a grade of 0 on affected course elements, 0 on the course, suspension, and expulsion.

Students who believe that they have been wrongfully or unjustly penalized have the right to grieve; refer to Policy 70, Student Grievance (<http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm>).

ENV students are encouraged to review the material provided by the university's Academic Integrity office (<http://uwaterloo.ca/academicintegrity/Students/index.html>).

Miscellanea

Research ethics: Please note that the University of Waterloo requires all research conducted by its students, staff, and faculty which involves humans as participants to undergo prior ethics review and clearance through the Director, Office of Human Research and Animal Care (Office). The ethics review and clearance processes are intended to ensure that projects comply with the Office's Guidelines for Research with Human Participants (Guidelines) as well as those of provincial and federal agencies, and that the safety, rights and welfare of participants are adequately protected. The Guidelines inform researchers about ethical issues and procedures which are of concern when conducting research with humans (e.g. confidentiality, risks and benefits, informed consent process, etc.). If the development of your research proposal consists of research that involves humans as participants, then please contact the course instructor for guidance and see <http://iris.uwaterloo.ca/ethics/>

Note for students with disabilities: The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the OPD at the beginning of each academic term.

Religious observances: As applicable, each student needs to inform the instructor at the beginning of term if special accommodation needs to be made for religious observances that are not otherwise accounted for in the scheduling of classes and assignments.

Potential Topics for the Research Methods Assignment

The following potential topics span natural and social science and quantitative and qualitative approaches. Questionnaire design, structured interviews, structured observation, meta-analysis, content analysis, Generalized Linear Models (GLMs), mixed-models, Generalized Additive Models (GAMs), Multivariate statistics (e.g., PCA, FA, MDS), Bayesian statistics, population viability analysis, habitat selection, ethnography, qualitative interviews (e.g., unstructured interviews), grounded theory.