Research Methods for Building Energy – CIVE5704

Winter 2019, Lectures: Mondays, 18:05-20:55, Mackenzie Building 3356
Instructor: Prof. Liam O'Brien, Ph.D., P.Eng., email: Liam.OBrien@carleton.ca, office: CB5208
Office hours: TBD

Course description

This course is motivated by the fact that graduate students are not formally trained in research methods, despite the fact the majority of their time during their graduate studies is devoted to research. There are a variety of hard and soft skills necessary for high-quality research that are currently left to students to learn on their own. This course seeks to provide graduate students who are focused on building performance-related topics (e.g., energy, comfort, environmental impact) with a skillset and the confidence to conduct and publish research in leading venues (international conferences, reputable journals).

The structure of the course is to follow the chronological path from conception of research to publication of a journal article. Meanwhile, a large variety of skills and knowledge will be taught, such as: the latest tools to conduct a literature review, professional data visualization techniques, estimation error in measurement, basic inferential statistics, how to structure a paper, academic writing style, submitting and revising papers for journals, and reference management software.

The course will be delivered as a hybrid of lecture and seminar style. Lectures by the professor will be given most weeks, while there will be many requirements for students to give mini-lectures, presentations, and other intensive forms of student participation and peer learning. As such, attendance for every week's session is critical and will be evaluated. The course is aimed at thesis-based graduate degrees (i.e., MASc and PhD) in Civil, Environmental, and Mechanical Engineering.

Learning objectives

- Develop the skills to design research
- Be very familiar with research methods used for building performance research
- Know how to conduct a comprehensive literature review and use referencing software
- Be able to apply data visualization tools to create professional and effective graphs
- Be able to perform basic error analysis from measured and modelled data
- Be familiar with the peer-review process and key journals in the area of building performance
- Be familiar with a variety of workflows for collaborative research and writing
- Know how to structure, write, submit, and revise, a journal manuscript
- Gain familiarity with basic inferential statistics

Evaluation

Participation	N/A	30% total, including: • 1% per lecture for attendance (up to 13) • 7% for active discussion in class • 10% for presentations and mini-lectures
Journal article critique assignment	Due February 11	10%
Draft paper	Due February 25	15%
Data analysis and visualization assignment	Due March 11	10%
Final presentation	Due April 1	10%
Final paper	Due April 20	25%

Course Materials

Course/exam material consists of: freely available textbook chapters, blackboard notes, PowerPoint presentations, and conference and journal papers. Hand-written/blackboard notes will not be made available online.

Participation
Participation will be evaluated in subjective (except attendance) manner by the professor. Participation includes, but is not limited to, active engagement during class, presentation quality and preparedness, and other interactions with students and the professor during class.

Assignments
The main assignment for the courses is to prepare a submission-ready paper that is related to your own research (or relevant topic of your choice). Peripheral assignments will be used to apply skills learned in class. Detailed instructions will be provided via separate documents on cuLearn.

Course website
cuLearn will be used for distribution of material, file submission, and grading.

Student accommodations
The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). Requests made within two weeks will be reviewed on a case-by-case basis. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website (www.carleton.ca/pmc) for the deadline to request accommodations for the formally-scheduled exam (if applicable).