DALHOUSIE UNIVERSITY
Faculty of Computer Science

CSCI – 6055 - Research Methods & Statistics
Course Syllabus
Summer 2019

Instructor Information

Instructor:	**Dr. Kirstie Hawkey**	**Office:**	**209, Goldberg**
E-mail:	hawkey@cs.dal.ca	**Office Hours:**	Mon: 2:30-3:30 Thurs 12:00-2:00
Class Time:	Tuesday 1:05-3:55	**Class Loc.:**	Mona Campbell 1201
Tutorial	Tuesday: 1:05-4:25	**Tutorial Loc.:**	Mona Campbell 1201
Course TA:	Hubert Hu	**TA Email:**	st553925@dal.ca

Homepage: Brightspace
Comunication: TBD all-cs6055@cs.dal.ca

Course Description

This class will provide computer science students with an understanding of the principles of empirical science as they relate to computer science research. The goal is for the student to determine the research methods most appropriate for their research area and to be able to design simple to moderately complicated research studies. The course covers both quantitative and qualitative research issues and will provide a practical introduction to the statistics through hand-on tutorials. In addition, this course will provide the basis for critical reading of research findings in the literature and students will gain experience with scientific writing.

This course will teach students how to assess the validity of other researchers' articles, and at the same time, enable students to validate their own research. The topics presented to students in lectures will include: the concept of scientific research, variables, validity, control, true experiments (single factor design, factorial design), quasi experiments, non-experimental research (surveys, interviews and observations), ethics, writing, plagiarism, and publishing. The topics presented to students in tutorials include developing a research question, introduction to statistics, descriptive statistics, hypothesis testing, inferential statistics, data preparation, and software packages. Tutorials will include lecture/discussion components and hands-on application of statistical procedures.

Important Dates

- Midterm Test: June 18, 2019
- Final Exam: TBA in the period of July 31-August 6, 2019
- Assignments: May 17, June 7, June 21, July 5
- Presentations: July 30
- Research paper: Draft July 9; Final version July 30;

Learning Outcomes

- Understand the process of scientific research,.
- Write a well-formed hypothesis.
- Identify independent and dependent variables.
- Assess the measurement validity of variables
- Assess the internal validity of various experimental designs.
- Assess the external validity of various experimental designs
- Analyze the trade-offs inherent in each experimental design
- Write a research proposal
- Present a research proposal
- Understand and interpret descriptive statistics
- Understand and interpret inferential statistics
- Understand null hypothesis testing and when to use it
- Understand confidence intervals and when to use them

Required Texts and Resources

A course archive of material available online and through handouts will be developed by the instructor and students. Additionally, students will be assigned weekly readings of research papers that demonstrate the topics under discussion.

Recommended text:

Reading Statistics and Research
Shuyler W. Huck
ISBN-13:978-0-205-51067-2
(any edition is fine)

Attendance

The primary source of communication will be in class and during tutorials. Attendance for both is expected; if you must miss a class/tutorial, please notify the instructor and/or TA and arrange with a fellow student to obtain any notes. Additional communications will be posted as news on Brightspace; through the course email list, which comprises the instructor's, TA's, and students' CS email accounts; and/or alternate communications channel TBD. It is the student's responsibility to check these channels of communication on a regular basis.

Evaluation

Evaluation Scheme:

Participation (tutorial + class + readings + pop quizzes)	10
Assignments (4)	20
Research Paper	20
Presentation	10
Mid-Term	15
Final	25
Total	100

Participation: Students are expected to attend the lectures and labs and participate in discussion of the materials and complete in-class exercises. **Each week, a research paper will be assigned that demonstrates the topic under discussion. Students are expected to read the research paper and submit two questions/comments for discussion prior to class. They are also expected to find a related research paper on their topic of interest and discuss how the concept relates to their research questions.** There will be periodic quizzes during the tutorials and lectures to evaluate students' comprehension of assigned reading materials and course content.

Assignments: There will be 4 assignments during which students will develop a research question (assignment 1) and then develop an appropriate research methodology that considers the issues of variables & measurement (assignment 2), experimental validity (assignment 3), hypothesis testing and control (assignment 4). These should be personalized to your own specific research questions so that the outcome of this course is of benefit to your research.

Research paper: The research paper will provide students with the opportunity to present the research methodology that they have developed through the assignments at a level more suited for publication. It will include an introduction that motivates the research problem, a related work section, their proposed research methodology, and a discussion of the benefits and limitations of their approach. A draft of the paper will be due mid-July to provide early feedback on intended content and to give students the opportunity to incorporate an editing cycle into their writing process.

Tutorials: The tutorials cover the statistical topics of the course and the material contained in the tutorials will be included on the mid-term and final exams.

Examinations: The mid-term and final exam will evaluate students understanding of the concepts discussed in class and the tutorials and their ability to apply that understanding to research scenarios.

Midterm and Final Exam Requirements

- Photo ID is required
- Closed book. No dictionaries, notes, calculators, cell phones, PDAs, talking slide rulers, or other electronic aids allowed.

Late Policy

- Reading questions and discussion are due at 12 noon on Tuesdays on Brightspace.
- All other submissions are due at the beginning of class or 12 noon on the day it is due, unless otherwise noted.
- Late submissions will be penalized by 15% per day late (1-24 hours late, 15% reduction; 25-48 hours late, 30% reduction; 49-72 hours late, 45% reduction; 72+ hours, not accepted)

Tentative Schedule and List of Topics

Date (wk of)	Lecture topics (Kirstie) (Tuesday, wkly 3 hour lecture)	Tutorial Topics (Hubert) (Thursday, wkly 3 hour tutorial/lab)	Due
May 6	Science & research: Why you need this course	Finding a research question	
May 13	Developing a research question; Writing, Publishing, Plagiarism	Iterating on your research question	Fri: Assignment 1 due
May 20	Variables	Descriptive Statistics Parametric vs. Nonparametric	
May 27	Validity	Data visualization Error bars	
June 3	Control	Confidence Intervals Bootstrapping	Fri: Assignment 2 due
June 10		Hypothesis testing Parametric Binary Statistical Inference	
June 17	Midterm	Non parametric binary statistical inference	Fri: Assignment 3 due
June 24	True Experiment – Single-Factor Design	Multiple Comparison Problems ANOVA testing	
July 1	True Experiment – Factorial Design	ANOVA and other types of regression	Fri: Assignment 4 due
July 8	Quasi Experiment	Chi squared tests	Tues: Draft of research paper due
July 15	Non-Experimental research: systems, people, Ethics	Data Preparation Excel	
July 22	Course Summary	Criticism of Null-Significance Hypothesis Testing	
July 29	Presentations (Kirstie & Hubert)	----------	Tues: Research Paper due
	Exam period (July 31-Aug 6)		

Responsible Computing Policy

Usage of all computing resources in the Faculty of Computer Science must be within the Dalhousie Acceptable Use Policies (http://its.dal.ca/policies/) and the Faculty of Computer Science Responsible Computing Policy. (https://www.cs.dal.ca/downloads/fcs_policy_local.pdf)

Academic Integrity[1]

At Dalhousie University, we respect the values of academic integrity: honesty, trust, fairness, responsibility and respect. As a student, adherence to the values of academic integrity and related policies is a requirement of being part of the academic community at Dalhousie University.

What does academic integrity mean?

Academic integrity means being honest in the fulfillment of your academic responsibilities thus establishing mutual trust. Fairness is essential to the interactions of the academic community and is achieved through respect for the opinions and ideas of others. "Violations of intellectual honesty are offensive to the entire academic community, not just to the individual faculty member and students in whose class an offence occurs." (see Intellectual Honesty section of University Calendar)

How can you achieve academic integrity?

- Make sure you understand Dalhousie's policies on academic integrity.
- Give appropriate credit to the sources used in your assignment such as written or oral work, computer codes/programs, artistic or architectural works, scientific projects, performances, web page designs, graphical representations, diagrams, videos, and images.
- Use RefWorks to keep track of your research and edit and format bibliographies in the citation style required by the instructor http://www.library.dal.ca/How/RefWorks
- Do not download the work of another from the Internet and submit it as your own.
- Do not submit work that has been completed through collaboration or previously submitted for another assignment without permission from your instructor.
- Do not write an examination or test for someone else.
- Do not falsify data or lab results.

These examples should be considered only as a guide and not an exhaustive list.

What will happen if an allegation of an academic offence is made against you?

I am required to report a suspected offence. The full process is outlined in the Discipline flow chart, which can be found at:
http://academicintegrity.dal.ca/Files/AcademicDisciplineProcess.pdf and includes the following:

1. Each Faculty has an Academic Integrity Officer (AIO) who receives allegations from instructors.
2. The AIO decides whether to proceed with the allegation and you will be notified of the process.
3. If the case proceeds, you will receive an INC (incomplete) grade until the matter is resolved.
4. If you are found guilty of an academic offence, a penalty will be assigned ranging from a warning to a suspension or expulsion from the University and can include a notation on your transcript, failure of the assignment or failure of the course. All penalties are academic in nature.

Where can you turn for help?

- If you are ever unsure about ANYTHING, contact myself.
- The Academic Integrity website http://academicintegrity.dal.ca has links to policies, definitions, online tutorials, tips on citing and paraphrasing.
- The Writing Center provides assistance with proofreading, writing styles, citations.

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[1] Based on the sample statement provided at http://academicintegrity.dal.ca.

- Dalhousie Libraries have workshops, tutorials, citation guides, Assignment Calculator, RefWorks, etc.
- The Dalhousie Student Advocacy Service assists students with academic appeals and student discipline procedures.
- The Senate Office provides links to a list of Academic Integrity Officers, discipline flow chart, and Senate Discipline Committee.

Student Accommodation

Students may request accommodation as a result of barriers related to disability, religious obligation, or any characteristic under the Nova Scotia Human Rights Act. Students who require academic accommodation for either classroom participation or the writing of tests and exams should make their request to the Advising and Access Services Center (AASC) prior to or at the outset of the regular academic year. Please visit www.dal.ca/access for more information and to obtain the Request for Accommodation – Form A.

A note taker may be required as part of a student's accommodation. There is an honorarium of $75/course/term (with some exceptions). If you are interested, please contact AASC at 494-2836 for more information.

Please note that your classroom may contain specialized accessible furniture and equipment. It is important that these items remain in the classroom, untouched, so that students who require their usage will be able to participate in the class.

Culture of Respect[2]

Every person has a right to be respected and safe. We believe inclusiveness is fundamental to education and learning. Misogyny and disrespectful behavior in our classrooms, on our campus, on social media, and in our community is unacceptable. We stand for equality. We hold ourselves to a higher standard.

What we all need to do:

1. **Be ready:** promise yourself to not remain silent, know that it will happen again, summon your courage whatever it takes. Practice things to say, open ended is good: "Why did you say that?" or "How did you develop that belief?"
2. **Identify the behaviour:** Use reflective listening, avoid labeling, name-calling or blame. Describe the behaviour, don't label the person: "Kim, what I hear you saying is that …"
3. **Appeal to principles:** this works well if the person is known to you like a friend, sibling, co-worker etc. "Joe, I have always thought of you as a fair-minded person, so it shocks me when I hear you say something like that."
4. **Set limits:** you cannot control another person, but you can control what happens in your space. "Please don't tell racist jokes in my presence anymore" or "This classroom is not a place where I allow homophobia to occur" and then follow through.
5. **Find an ally/be an ally:** seek out like-minded people for support or support others in their challenges. Lead by example and inspire others to do the same.

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[2] Source: Speak Up! © 2005 Southern Poverty Law Center. First Printing. This publication was produced by Teaching Tolerance, a project of the Southern Poverty Law Center. Full "Speak Up" document found at: http://www.dal.ca/dept/dalrespect.html. Revised by Susan Holmes from a document provided April 2015 by Lyndsay Anderson, Manager, Student Dispute Resolution, Dalhousie University, 902.494.4140, lyndsay.anderson@dal.ca www.dal.ca/think.

6. **Be vigilant:** change happens slowly, but be prepared, and keep speaking up. Don't let yourself be silenced.

Recognition of Mikmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mikmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit the office in the McCain Building (room 3037) or contact the programs at elders@dal.ca or 902-494-6803 (leave a message).

Learning and Support Resources

- General Academic Support — Advising http://www.dal.ca/campus_life/student_services/academic-support/advising.html
- Fair Dealing Guidelines https://libraries.dal.ca/services/copyright-office/guidelines/fair-dealing-guidelines.html
- Dalhousie University Library http://libraries.dal.ca/