IAT 802 Quantitative Research Methods and Design
or the Craft of Scientific Research

3 credits Fall 2013 Instructor: Bernhard Riecke

Draft course description – subject to change.

Course website: [http://www.sfu.ca/~ber1/iat445/](http://www.sfu.ca/~ber1/iat445/); Student presentations from previous course offering can be found [here](http://www.sfu.ca/~ber1/iat445/)
Course management system: [http://www.sfu.ca/canvas](http://www.sfu.ca/canvas)
Instructor: Prof. Bernhard Riecke
E-mail: ber1 [at] sfu.ca Web: iSpaceLab.com/Riecke or [www.siat.sfu.ca/faculty/profile/bernhard-riecke](http://www.siat.sfu.ca/faculty/profile/bernhard-riecke)
Office: 2nd floor, 2-830

Prerequisites
No formal pre-requisites.

Course Description & Motivation
Your education, research, and thesis work at SIAT (and beyond) requires you to engage in various forms of doing and communicating research. Moreover, your success at SIAT and beyond will in part be evaluated based on the quality of your own research and communication thereof.

The overarching goal of this course is to help you develop the knowledge & skills essential for designing and conducting proper scientific and quantitative research, as well as critically analyzing, discussing, and communicating it. In sum, IAT 802 is an introduction to experimental design and research methodologies where quantitative approaches are appropriate. There will be particular focus on research design for HCI and the sciences.

Course Objectives, Learning Goals & Outcomes
The course structure and teaching/learning activities are designed around the following questions. That is, by actively participating in this course, student should be able to effectively address the following questions and perform the respective tasks:

1) **What is science, the “scientific method” and quantitative research? How do you think and argue like a good scientist?**

2) **Why do science? What is scientific & quantitative research useful for?**
   a) Why could you be excited about science? What drives and excites a researcher?
   b) What are advantages and disadvantages of quantitative & scientific research methods (as compared to other methods)? That is, what are they appropriate and useful for?

3) **What to research? Why research something?**
a) How to devise effective research questions and hypotheses?

b) How to effectively motivate research questions?

4) How to use quantitative & scientific methods properly, carefully & effectively?
   a) Experimental design: How to design an effective experiment? What does effective mean?
   b) Descriptive statistics: How to present data effectively? What does effective mean?
   c) Inferential statistics: What can you conclude from quantitative data? Why? What are your chances of being wrong? How do you decide which statistical methods to use? How to apply them properly? How to do this in a given statistical analysis software?

5) How to communicate all that effectively and scholarly?

6) How to critically evaluate and discuss the quality of quantitative / scientific research (of yourself and others)?

**Teaching/learning Activities**

Teaching/learning activities may include

- Interactive lecturing and demonstrations
- Group discussions (in-class and online chat- and discussing forums)
- Short in-class writing activities
- Weekly reading, writing and/or revision/reviewing assignments
- Weekly short written reflection papers (JiTTs) that provide the basis for in-class discussions and activities
- Roughly bi-weekly in-class mini-quizzes (adapted from Team-Based Learning concepts)
- Online and in-class tutorials on experimental design, probability, and statistics
- Group research projects (early in semester) and final individual research projects where students get a chance to work with actual data
- Group/individual feedback
- Peer-reviewing (formal & informal)
- Student presentations (including elevator pitch presentations and final public project presentation)
- Teams of 2-4 students each will be used for focused teamwork both in- and out-of-class

**Evaluation Structure** *(draft, will be finalized as part of course contract discussion in class)*

22%  JiTT/Reflection papers, short in-class quizzes & presentations, participation & peer evaluations/reviews

20%  Iron Researcher test(s): Analyze provided data & write up in scholarly manner

8%   Research project pitch: short written proposal + presentation

**Note:** These outlines are drafts and are subject to change. V. 4. September 2013
8%  Research methods presentation
10%  Final project presentation in SIAT research colloquium
32%  Final written project report

NOTE: Regular attendance and active, supportive participation in class and team activities is necessary to pass; else could result in point reduction/no-pass. In particular, failure to contribute sufficiently to in-class activities, individual and team assignments, failure to responsibly do your part of the teamwork, or failure to reliably attend and contribute in team meetings can result in additional point reductions beyond the participation & peer evaluation.

NOTE: To be eligible for full marks in the major assignments, you must complete the corresponding weekly in-class activities. Although these may not be formally marked, completion of these activities is a prerequisite for the corresponding major assignments, and failure to complete them appropriately could result in overall point reduction. Any kind of plagiarism or other forms of academic dishonesty will automatically result in 0 points for that assignment, and potentially in more serious consequences including course failure.

Texts, Resources & Materials:

Required

• Field, A., & Hole, G. J. (2003). How to Design and Report Experiments. Sage Publications. ISBN: 0761973834 [this is the main textbook we’ll use – make sure to have your own copy by the first week of the semester]
• Open Learning Initiative Statistics (online learning modules, potentially with a $25.00 fee. Registration infos will be provided in class / by email)

Suggested additional Resources (many on reserve):


Reference Readings: Statistics explained in simple terms

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• excellent free online interactive statistics & probability course from Udacity by Sebastian Thrun (although rather basic)

• **StatisticsHell**: Excellent & humorous statistics resources & online lecture videos by Andy Field

**Reference Readings: Advanced & Modern Statistics Methods**


**Further Reference Readings:**


• “The earth is spherical (p < .05): Alternative methods of statistical inference” by K. J. Vicente & G. L. Torenvliet “Theoretical Issues in Ergonomics Science” (2001); v. 1; pages 248 – 271

• “You can't play 20 questions with nature and win: Projective comments on the papers of this symposium” (1973) by A. Newell; in W. G. Chase (Ed.) *Visual Information Processing*, New York: Academic Press; pages 283 - 308

Supplementary readings will be announced as needed
Policies

Email & Canvas messaging: it’s an asynchronous medium – expect response within 1-2 days during weekdays (occasionally longer if I’m out of the office).

For ALL email correspondence, please add [IAT 802] and a meaningful title to the email “subject” to allow me to more effectively handle your emails. When emailing about a team activity, please CC all your team members. Please do not email the instructor & TA separately, CC instead.

External contributions to your submitted documents (e.g., proofreading, copy-editing, writing center feedback, support with statistics etc.)

If someone other than yourself (or team-mates whose contribution has already been explicitly stated in the acknowledgments) was helping you with your project or in the preparation of a submitted document, you are required to list their full name, email address, relationship to you, and declare in writing what specifically their contribution to the final document is in an “Acknowledgments” section. This has to be explicitly stated as part of the submitted document. Failure to do so violates academic honesty and can have serious consequences including grade reduction. If unsure, please contact me well in advance.

Project work across multiple courses

In principle I have no problem with the same research project serving two different courses, but this means that the actual work has to be considerably bigger than required in either course, and that the project topic fits the nature of this course. This must be cleared with me in writing before the project is approved. Failure to do so will result in the project being marked out of 50%.

Authorship rules for this course

(Co-)authorship is often treated as the currency of academia and can lead to a number of unnecessary discussions and conflicts. These issues will be discussed in the seminar. To avoid those issues as much as possible, we will use the following default authorship rules for this course: Submission/publication of projects conducted and/or material written in the context of this course is integral part of this course and explicitly encouraged. I will do my best to support and foster this throughout the course and beyond. That is, if the work that is conducted and/or manuscript that will be written in the course of this seminar is (later or in parts) to be submitted for publication (which is highly encouraged), (co-)authorship has to be offered (as is customary in academia) to people who made a significant contribution, including the instructor (i.e., me) and the student’s senior supervisor, unless either of them waive it.

As is usual for joint-author publications, all listed authors need to be included in the discussion of the best publication venue and are given the chance and sufficient time to review and revise the manuscript before final submission. Students should consult with their senior supervisor and ask for permission for the extra effort required in preparing their work for publication.

Note that my role as a co-author changes somewhat after the final course paper is graded: Before the final paper submission for grading, I should obviously not actively re-write or copy-edit the students’ paper (as this would imply me grading my own edits ;-) ). Instead, I will provide oral and
written feedback at various stages (e.g., research question, experimental design, analysis methods, overall writing and paper structure etc. as well as providing a structured approach towards conducting a scientific research project (“scientific study journal guideline”)) while leaving the responsibility for incorporating these suggestions with the student. In addition, I will do my best to support and facilitated the students’ projects and manuscript writing and revision by creating a collegial and supporting learning atmosphere, writing teams, peer-reviewing sessions (in-class and out-of-class), discussions (e.g., devil’s advocate games), mini-presentations, feedback sessions, and various shared writing, revision, and reviewing guidelines.

If you should ever feel like you don’t get enough feedback on your project or writing, please contact me (early enough) and schedule an appointment with me, as one-on-one feedback is typically more effective than email feedback.

Once the course is over and the course papers are graded, I can offer additional help in the revision and editing of the manuscript to maximize the chances of getting published, just as other co-authors do.

Please contact me in advance if you should have any concerns regarding these authorship rules. These rules are meant to avoid potential conflicts and create a win-win-win situation between all involved people (typically the student, their senior supervisor, and me).

**Extensions & Missed Assignments**

If you miss a class, it is your responsibility to review the class slides and related material, and to observe deadlines. A Doctor's note is required for any missed graded assignments or exams. If you need an extension on an assignment, submit a written request to me by email. Present a compelling reason for your request and be specific about the length of extension you need. NOTE: I must receive the request at least 3 days before the assigned due date. You will receive a reply via email (and if an extension is granted, I'll ask you to attach a copy of it to your assignment).

**Submission of assignments and deadlines**

To ensure fairness across the class, assignment deadlines will be strictly observed. All written submissions will be to the course management system. Late submissions will be automatically penalized

- 10% for up to 1 day late
- 30% for 1-2 days late
- 60% for 2-3 days late
- 100% for more than 3 days late.

That is, if an assignment is submitted 1 minute late (using Canvas time as the standard), then it will be automatically penalized 10%. If it is, e.g., 2 days + 1 minute late, it will be penalized 60%.

Note that we typically allow unlimited numbers of re-submissions (this is indicated in the Canvas assignment). These are without late penalties as long as all resubmissions (incl. the latest) are BEFORE the due date – if re-submitted after the due date, late-submission penalties apply, so please be aware. Canvas allows you to submit as DRAFT – however, these do not count as
submissions and we are unable to see the content of these draft submissions; hence, we do not recommend the usage of draft submissions.

Please limit all uploaded material to no more than 5MB per file. Most, if not all, pdf exporters or printers have multiple options for reducing file sizes; please take advantage of these to reduce the file size to a reasonable limit before uploading.

Please double-check whenever you submit/upload to Canvas. If it's not up there, we won't be able to grade/check it. There will be no excuses whatsoever for lost/un-submitted assignments or not double-checking that your assignment is properly uploaded (not linked!) to Canvas and in the proper format (typically only .pdf). To ensure it’s properly submitted to Canvas, you might want to (after submitting) download your assignment and check whether it opens properly.

Please do not email us assignments or bring printed assignments unless there is a technical issue with submitting on Canvas (in this case, please notify us a.s.a.p. so it can be fixed).

**Academic Honesty and Student Conduct Policies**

Students are expected to follow SFU's code of academic honesty and student conduct. You are expected to become familiar with the institutional policies related to assessment and other policies at Simon Fraser University. Academic dishonesty in any form will not be tolerated. This includes all forms of plagiarism, which could result in substantial point reduction or no-pass. Please review the following links: http://www.sfu.ca/policies/Students & http://www.sfu.ca/policies/teaching. I am required to forward all suspected cases of academic misconduct to the Director of SIAT, the Grad Studies Chair and the Dean of Graduate Studies, where they will be pursued to resolution. This is a very unpleasant process for all involved, so please do not put us in this situation.

**SIAT Academic Honesty Statement:**

Academic dishonesty is a serious academic offence that will result in a severe academic penalty. The SFU policy on academic honesty is stated in the Code of Academic Honesty (T 10.02). This is available at [http://www.sfu.ca/policies/teaching/t10-02.htm](http://www.sfu.ca/policies/teaching/t10-02.htm). University procedures and penalties for acts of academic dishonesty are detailed in the SFU teaching policies available at [http://www.sfu.ca/policies/teaching](http://www.sfu.ca/policies/teaching).

All students are responsible for familiarizing themselves with these policies. Ignorance of these standards will not preclude the imposition of penalties.

**Plagiarism** is the most common form of academic dishonesty arising in the context of students fulfilling their academic responsibilities. It involves using another author’s words without proper attribution. Plagiarism includes self-plagiarism which involves submitting substantively the same work for academic evaluation more than once. See [http://www.lib.sfu.ca/help/tutorials/plagiarism-tutorial](http://www.lib.sfu.ca/help/tutorials/plagiarism-tutorial) for a tutorial.

The following acts will be treated as instances of plagiarism:

- Submitting, in fulfillment of course requirements, a paper or other work, or part thereof, that has been written, produced or researched by another person.
- Submitting, in fulfillment of course requirements, a paper, other work or part thereof, that has previously been submitted for the same or for a different course, even where the work is authored by the student concerned.

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• Quoting or paraphrasing material in a paper or other work, submitted in fulfillment of course requirements, that has been authored or produced by another, without acknowledging the reference by proper citation.
• Representing in any way, another’s ideas or expressions as one’s own in a paper or other work submitted in fulfillment of course requirements.

Other forms of academic dishonesty include:
• Cheating on an examination.
• Falsifying material subject to academic evaluation.
• The use of any unapproved aids or the unapproved sharing of material during an examination.
• The unauthorized possession or use of an examination or assignment.
• Using or attempting to use other students' answers.
• Providing answers to other students.
• Failing to take reasonable measures to protect answers from use by other students in assignments, projects or examinations.
• Submitting identical or virtually identical assignments by students who studied together.
• Impersonating a candidate in an examination or availing oneself of the results of such impersonation.
• Submitting false information, records, laboratory results, documents, transcripts or other academic credentials.
• Stealing or destroying the work of another student.
• Inappropriately depriving others of the opportunity to have access to the academic resources of the library.
• The inappropriate use of technology in course work, assignments or examinations.

Requests for Reconsideration of Grades and/or Marks Assigned for Interim Grades

This policy pertains only to interim grades assigned throughout a course in an IAT course. Final grades are governed by SFU Policy T20.01 – www.sfu.ca/policies

Students requesting a mark/grade reconsideration must contact the instructor or TA who marked their work within 10 days of receipt of their mark/grade in writing. If a resolution cannot be found immediately, it is the responsibility of the course instructor to review the grading of a TA. There should be consensus here. If work was initially marked by the instructor, the instructor will liaise with the Chair of the Undergraduate Curriculum Committee or School Director to identify an appropriate faculty member to review the grading.

Requests for a change must be timely: the request must be received by the instructor within 10 days of receipt of the mark/grade by the student as laid out in SFU Policy T20.01. In the event of disagreement between this policy and T20.01, T20.01 shall prevail.

The request must be substantive and should reference missed evidence or an error in marking or calculating the mark or grade. The result may be a decrease in the mark/grade, an increase or the mark/grade may remain unchanged.

See also http://www.siat.sfu.ca/files/File/PDF%20Files/Student-Conduct-Policies%281%29.pdf for general SIAT student conduct policies.

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