UNIVERSITY OF TORONTO

PSYD55 LEC01:

Functional Magnetic Resonance Imaging Laboratory

Winter 2020

Tuesday 11am – 1pm, Room SW316

Instructor:	Dr Andy C. H. Lee
Email:	psyd55.utsc@gmail.com
Website:	Quercus

1. Course Description and Objectives

This course is designed to introduce students to the basics of functional magnetic resonance imaging (fMRI) as used in the field of cognitive neuroscience, using a combination of lectures, practical exercises, group work, and individual assignments. We will cover some of the fundamental principles of this methodology including MR physics, experimental design, data pre-processing, statistical analysis, and results reporting. The aim is that by the end of this course, you will be able to:

- Appreciate the importance of fMRI to cognitive neuroscience and how it complements other research approaches in cognitive neuroscience such as patient neuropsychology and electroencephalography.
- Understand the core physical and statistical principles behind fMRI, which allow researchers to make inferences about neural activity and cognition from 'blobs on brains'.
- Identify the strengths and weaknesses associated with fMRI, including different experimental designs and statistical approaches.
- Design an effective fMRI paradigm to address an appropriate research question of interest.
- Apply basic knowledge of specialist fMRI software and statistics to preprocess and analyse individual subject and group fMRI data.
- Communicate fMRI research ideas and findings effectively in writing and orally.
- Critically evaluate fMRI findings reported in the primary research literature in order to judge the validity of the conclusions that have been made.

2. Course Requirements

2.1. Attendance & Class Participation (5% overall grade).

Classes will be a mixture of lectures, group work, and practical exercises. By attending all classes, participating in group work and completing the assigned practical exercises, you will receive the full 5%. It is essential, therefore, that you make every effort to attend each week, particularly as the course material builds from one week to the next. Unavoidable absences (e.g. illness, emergencies) will be excused with relevant documentation.

2.2 Four Mini Quizzes (2.5% overall grade each, 10% total).

There will be a short online quiz on Quercus for each of the main modules in the course (i.e. MR physics, Experimental design, Pre-processing, Univariate statistics). Each quiz will consist of 5 multiple choice questions and you will be required to do them after the relevant course material has been covered. The aim of the quizzes is simply to help you think about and digest the course material – you can do each quiz as many times as you like until you answer all questions correctly. Successful completion of each quiz, with all questions correct will count as 2.5% towards your final grade.

2.3 Written Assignment 1 (15% overall grade; submitted via Quercus): Critique Paper.

The goal of this assignment is to develop your understanding of fMRI methodology. You will be required to read an assigned experimental article (see course website) and write a ~800 word critique paper in response. In this paper, you must summarize the aim, main methods, results and conclusions of the article, and on the basis of your current knowledge of fMRI, critically evaluate the methods that were used, and whether the authors' conclusions are justified.

2.4 Group Presentation (15% total).

The goal of this activity is to provide further understanding of experimental design for fMRI. You will be required to work in groups of 3 – 4 to design an fMRI study. There will be a list of experimental questions to choose from. Each group will present their design to the rest of the class in a 10-minute presentation, using a PowerPoint (or equivalent) slideshow. This presentation will describe the details of the behavioural paradigm to be used, and recommended scanning parameters.

2.5 Written Assignment 2 (20% overall grade): Experimental Design Paper.

The goal of this assignment is to develop written communication of fMRI methodology. You will be required to submit your own written description of your group's fMRI experimental design (see **2.4 Group Presentation**). This should be similar to a journal article-style methods section providing details of the experimental paradigm, number of subjects, and scanning protocol.

2.6 Written Assignment 3 (35% overall grade; submitted via Quercus): Final Paper.

The goals of this assignment are to develop your understanding of fMRI methodology and written communication of fMRI research. There are two parts to this Final Paper:

A) Revisiting Critique Paper: You will be asked to revisit the Critique Paper that you wrote earlier in the course (Written Assignment 1) and in particular, reconsider your critical analysis of the assigned experimental article. On the basis of the knowledge you have acquired over the course of the term, please edit this section accordingly and resubmit as part of the Final Paper. Has your opinion/evaluation of this article changed knowing what you know now?

B) Practical Exercise Write-up: You will be required to write-up the analysis steps and results from the in-class practical exercises. This should be similar to a journal article's methods and results sections providing details of fMRI data pre-processing, statistical analysis, and findings using both prose and diagrams.

An important note on plagiarism: Please review this website which describes tips on how not to plagiarize: http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize.

Electronic copies of the papers must be submitted by the specified time on the specified day (see details in Section 4. Tentative Schedule) via the course website on Quercus. It is not necessary to submit a hard copy.

3. Assigned Reading

There will be no required reading for this course, other than the experimental article for Written Assignment 1. All information will be conveyed via class lectures and slides (making it essential, therefore, that you attend all classes). For those who have a particular interest in fMRI, a separate document will be uploaded to the course website in the early stages of the course. This document will contain recommended text for you to read in your own time and/or use as a reference if you go on to conduct fMRI research in the future (e.g. as part of graduate school). In many cases, the level of detail in the recommended articles (e.g. mathematical background) is far beyond what is covered in the current course.

4. Tentative Schedule

Date	Topic	Quizzes & Assignments due
Jan 7	Getting started & Basic magnetic resonance physics lecture I	
Jan 14	Basic magnetic resonance physics lecture II	
Jan 21	Experimental design lecture I	11am Critique Paper
Jan 28	Experimental design lecture II	11am Quiz 1
Feb 4	Experimental design group work	
Feb 11	Experimental design group presentations	
Feb 18	Reading week	11am Quiz 2
Feb 25	Pre-processing lecture I & practical exercises	11am Experimental Design Paper
Mar 3	Pre-processing lecture II & practical exercises	
Mar 10	Pre-processing practical exercises	
Mar 17	Univariate statistics lecture I & practical exercises	11am Quiz 3
Mar 24	Univariate statistics II & practical exercises	
Mar 31	Univariate statistics practical exercises	
Apr 3		11:59pm Quiz 4 & Final Paper

Lecture slides will be posted on the course website (in the "Content" section) by midnight at the latest the night before the lecture.

5. Course Policies

5.1 Late Assignments

All assignments are due by 11:00am or 11:59pm on the specified due date (see Section 4. Tentative Schedule). Except in the case of a documented emergency (see above), for every 24 hours that the paper is late, 10% will be docked off the final mark. For instance, for the first deadline Jan 21st, a paper handed in past 11:00am on Jan 22nd will only receive 90% of the mark the quality of the work deserves, a paper handed in past 11:00am on Jan 23rd will only receive 80% of the mark the quality of the work deserves, and so forth. Appropriate documentation is required in all emergency situations. Unless you have a legitimate, documented emergency, NO EXTENSIONS WILL BE GIVEN.

5.2 Missed term work due to medical illness or other emergencies

All students citing a documented reason for missed term work must submit their request for accommodations within three (3) business days of the deadline for the missed work.

Students must submit BOTH of the following:

1. A completed Request for Missed Term Work Accommodations form (http://uoft.me/PSY-MTW), and
2. Appropriate documentation to verify your illness or emergency, as described below.

Appropriate documentation:
For missed ASSIGNMENTS due to ILLNESS:

- Submit the Request for Missed Term Work Accommodations form (http://uoft.me/PSY-MTW), along with a hardcopy of the Self-Declaration of Student Illness Form (uoft.me/PSY-self-declare-form).

For missed ASSIGNMENTS due to ACCESSABILITY REASONS:

- If your desired accommodation is within the scope of your Accommodation Letter (ex. your letter includes "extensions of up to 7 days" and you need 3 days), submit the Request for Missed Term Work Accommodations form (http://uoft.me/PSY-MTW) and attach a copy of your letter. Specify how many days extension you are requesting on the request form.
- If your desired accommodation is outside the scope of your Accommodation Letter (ex. your letter includes "extensions of up to 7 days" but you need more time than that) you will need to meet with your AccessAbility consultant and have them email Keely (keely.hicks@utoronto.ca) detailing the accommodations required.

For missed term tests or assignments in OTHER CIRCUMSTANCES:

Submit the Request for Missed Term Work Accommodations form (http://uoft.me/PSY-MTW), along with:

- In the case of a death of a family member or friend, please provide a copy of a death certificate.
- For U of T varsity-level or professional athletic commitments, an email from your coach or varsity administrator should be sent directly to Keely Hicks (keely.hicks@utoronto.ca) well in advance of the missed work, detailing the dates and nature of the commitment.
- For religious accommodations, please email (keely.hicks@utoronto.ca) well in advance of the missed work.
- For circumstances outside of these guidelines, please email Keely (keely.hicks@utoronto.ca) on or before the date of the test / assignment deadline to describe your circumstances and ask what documentation would be appropriate

Documents covering the following situations are NOT acceptable: medical prescriptions, personal travel, weddings/personal/work commitments.

Procedure:
Submit your (1) request form and (2) medical/self-declaration/other documents in person WITHIN 3 BUSINESS DAYS of the missed term test or assignment.

Submit to: Keely Hicks, Room SW420B, Monday – Friday, 9 AM – 4 PM. (Slide forms under door if out of office.)

After submitting your documentation, within approximately one to five business days, you will receive a response from your instructor detailing the accommodations to be made (if any).

You are responsible for checking your official U of T email and Quercus course announcements daily, as accommodations may be time-critical.

You should continue to work on your assignments to the best of your ability, as extension accommodations may be as short as one business day, depending on the nature of the illness/emergency.

If an accommodation has been granted but you are unable to meet the conditions of the accommodation (ex. you need a longer extension, or you missed a make-up test), you will need to repeat the missed term work procedure and submit additional forms to request further accommodation. Note that in the case of a missed make-up test, an opportunity to write a second make-up test may not be provided.

Completion of this form does NOT guarantee that accommodations will be made. The course instructor reserves the right to decide what accommodations (if any) will be made. Failure to adhere to any aspect of this policy may result in a denial of your request for accommodation.

Missed Accommodations

If an accommodation is granted but a continued illness/emergency prevents you from meeting the requirements of your accommodation, you must repeat the missed term work procedure to request additional accommodations.

(E.g.) If you miss a make-up midterm, you would need to submit another Request for Missed Term Work Accommodations form. If your original medical note / documentation included the date of the make-up midterm, then only the Request form is required. If the date of the make-up midterm fell outside of the dates indicated on your original medical note/other documentation, then a new medical note/other appropriate documentation must also be submitted.

Importance of Three Business Day window:

If you are unable to submit your documents in-person within the three business day window, you must email Keely (keely.hicks@utoronto.ca) within the three business day window to explain when you will

be able to bring your documents in person. Exceptions to the documentation deadline will only be made under exceptional circumstances. Attach scans of your documentation, and be prepared to bring your documents to Keely in-person as soon as you are well. Late documents may not be accepted.

NOTE: Assignments due at end of term

Instructors cannot accept term work any later than five business days after the last day of class. Beyond this date, you would need to file a petition with the Registrar's Office (https://www.utsc.utoronto.ca/registrar/term-work).

5.3 Grading Scale

NUMERICAL MARKS	LETTER GRADE
90 - 100%	A+
85 - 89%	A
80 - 84%	A-
77 - 79%	B+
73 - 76%	B
70 - 72%	B-
67 - 69%	C+
63 - 66%	C
60 - 62%	C-
57 - 59%	D+
53 - 56%	D
50 - 52%	D-
0 - 49%	F

Guidelines (http://www.writing.utoronto.ca/advice/general/grading-policy):

A+ Outstanding performance, exceeding even the A described below.

A Exceptional performance: strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter with sound critical evaluations; evidence of extensive knowledge base.

B Good performance: evidence of grasp of subject matter; some evidence of critical capacity and analytic ability; reasonable understanding of relevant issues; evidence of familiarity with the literature.

C Intellectually adequate performance: student who is profiting from her or his university experience; understanding of the subject matter and ability to develop solutions to simple problems in the material.

D Minimally acceptable performance: some evidence of familiarity with subject matter and some evidence that critical and analytic skills have been developed.
F Inadequate performance: little evidence of even superficial understanding of the subject matter; weakness in critical and analytic skills; with limited or irrelevant use of literature.

Note: for all written work, consistently poor spelling/grammar will be penalised. Please make use of the UTSC writing centre if you feel you need additional help with writing or want to develop your writing skills further: http://ctl.utsc.utoronto.ca/twc/.

5.4 Contesting a grade

All requests for a re-grade must be submitted in writing within two weeks of the day the grade is received. Only requests that include adequate written justification of an error in the original grading will be considered. A legitimate request will result in the entire exam or assignment being re-graded. Your overall grade may be raised, lowered, or it may stay the same. If there has been an error in our arithmetic, please let us know and we will immediately recalculate your grade (no written request necessary). Arbitrary requests for grade increases will not be entertained.

5.5 Video and Auditory Recording

For reasons of privacy as well as protection of copyright, unauthorized video or audio recording in classrooms is prohibited. This is outlined in the Provost's guidelines on Appropriate Use of Information and Communication Technology. Note, however, that these guidelines include the provision that students may obtain consent to record lectures and, "in the case of private use by students with disabilities, the instructor's consent must not be unreasonably withheld."

5.6 Accessibility

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible.

5.7 Academic Integrity

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (http://www.governingcouncil.utoronto.ca/policies/behaveac.htm) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In papers and assignments:

- Using someone else's ideas or words without appropriate acknowledgement.

- Submitting your own work in more than one course without the permission of the instructor.
- Making up sources or facts.
- Obtaining or providing unauthorized assistance on any assignment.

On tests and exams:

- Using or possessing unauthorized aids.
- Looking at someone else's answers during an exam or test.
- Misrepresenting your identity.

In academic work:

- Falsifying institutional documents or grades.
- Falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see http://www.utoronto.ca/academicintegrity/).