



PSYD55 LEC01:
Functional Magnetic Resonance Imaging Laboratory
Winter 2023
Wednesday 10 am – 12 pm, SW316

Instructor:	Dr Andy C. H. Lee
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Website:	Quercus
Office hours:	Thursday 1-2 pm, location TBC

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 (4% 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 4%. 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 (1.5% overall grade each, 6% 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 1.5% 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 (no more than 1000 words) 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 (25% 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 5. 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. Quercus

This course uses the University's learning management system, Quercus, to post information about the course. This includes posting readings and other materials required to complete class activities and course assignments, as well as sharing important announcements and updates. The site is dynamic and new information and resources will be posted regularly as we move through the term, so please make it a habit to log in to the site on a regular, even daily, basis. To access the course website, go to the U of T Quercus log-in page at <https://q.utoronto.ca>. Once you have logged in to Quercus using your UTORid and password, you should see the link or "card" for 'PSYD55 Functional Magnetic Resonance Imaging Laboratory'. You may need to scroll through other cards to find this. Click on the 'PSYD55 Functional Magnetic Resonance Imaging Laboratory' link to open our course area, view the latest



announcements and access your course resources. There are Quercus help guides for students that you can access by clicking on the "?" icon in the left side column.

SPECIAL NOTE ABOUT GRADES POSTED ONLINE: Please also note that any grades posted are for your information only, so you can view and track your progress through the course. No grades are considered official, including any posted in Quercus at any point in the term, until they have been formally approved and posted on ACORN at the end of the course. Please contact me as soon as possible if you think there is an error in any grade posted on Quercus.

5. Tentative Schedule

Date	Topic	Quizzes & Assignments due
Jan 11	Getting started & Basic magnetic resonance physics lecture I	
Jan 18	Basic magnetic resonance physics lecture II	
Jan 25	Experimental design lecture I	
Feb 1	Experimental design lecture II	10 am Critique Paper; Quiz 1
Feb 8	Experimental design group work	
Feb 15	Experimental design group presentations	
Feb 22	Reading week	
Mar 1	Pre-processing lecture I & practical exercises	10 am Experimental Design Paper; Quiz 2
Mar 8	Pre-processing lecture II & practical exercises	
Mar 15	Pre-processing practical exercises	
Mar 22	Univariate statistics lecture I & practical exercises	10 am Quiz 3
Mar 29	Univariate statistics II & practical exercises	
Apr 5	Univariate statistics practical exercises	
Apr 10		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. Last day to drop the course without academic penalty is March 27th, 2022.

6. Course Policies

6.1 Late Assignments

All assignments are due by 10 am or 11:59 pm 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 Feb 1st, a paper

handed in past 10 am on Feb 2nd will only receive 90% of the mark the quality of the work deserves, a paper handed in past 10 am on Feb 3rd 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.

6.2 Missed term work due to medical illness or other emergencies

For missed term work (assignments and term tests) due to illness, emergency, or other mitigating circumstances, please follow the procedures outlined below.

Note:

- The following reasons are not considered sufficient for missed term work: travel for leisure, weddings, personal commitments, work commitments, human error.
- [Missed Final Exams](#) are handled by the Registrar's Office and should be declared on eService.
- Instructors cannot accept term work any later than five business days after the last day of class. Beyond this date, accommodations are only possible via the Registrar's Office [petition process](#).

The email address to submit missed term work accommodation requests in **PSYD55** is:
psyd55.uts@gmail.com

ILLNESS OR EMERGENCY accommodations:

For missed work due to ILLNESS OR EMERGENCY, complete the following process:

1. Complete the [Request for Missed Term Work Accommodations Form](#).
2. Declare your absence on [ACORN](#) (Profile & Settings > Absence Declaration)
3. Email **both** of the following items to the course email **WITHIN 2 BUSINESS DAYS** of the missed work:
 - a. the [Request for Missed Term Work Accommodations Form](#)
AND
 - b. a screenshot of your Self-Declared Absence on ACORN

Note:

- *If you are unable to submit your request within 2 business days, you must still email your instructor within the 2 business day window to explain the nature of the delay. Exceptions to the 2 business day deadline will only be made under exceptional circumstances.*
- *If your absence is declared on ACORN, we do not require any additional supporting documentation (e.g. medical notes) to support your missed term work accommodation request.*

ACADEMIC CONFLICT accommodations:

For missed term work due to an ACADEMIC CONFLICT (e.g. two midterms at the same time):

1. Complete the [Request for Missed Term Work Accommodations Form](#).
2. Take screenshots of your course Quercus pages that demonstrate the conflict.

3. Email the form and screenshots to the course email **at least two weeks (10 business days) before the date of the activity**, or as soon as possible if it was not possible to identify the conflict earlier. Requests sent after the activity deadline may not be accommodated.

Note:

- *Multiple assignments due on the same day are not considered conflicts. Students are expected to manage their time effectively to meet assignment deadlines.*
- *Back-to-back tests/quizzes are not considered conflicts. Only overlapping activities are conflicts.*
- *Students are responsible for keeping their course timetables conflict-free. Students who register in two courses with overlapping lecture/tutorial/lab schedules will not be accommodated.*

RELIGIOUS CONFLICT accommodations:

For missed term work due to a RELIGIOUS CONFLICT:

1. Complete the [Request for Missed Term Work Accommodations Form](#).
2. Email the form to the course **email at least two weeks (10 business days) before the date of the activity**, or as soon as possible if it was not possible to identify the conflict earlier. Requests sent after the activity deadline may not be accommodated.

ACCESSABILITY SERVICES accommodations:

For missed **TERM TESTS** due to ACCESSABILITY REASONS:

- **Contact your AccessAbility consultant** and have them email the course email detailing accommodations required.

For missed **ASSIGNMENTS** due to ACCESSABILITY REASONS:

- If your desired accommodation is **within the scope** of your Accommodation Letter (e.g. your letter includes “extensions of up to 7 days” and you need 3 days):
 1. Complete the [Request for Missed Term Work Accommodations Form](#).
 2. Email the form ***AND*** your **Accommodation Letter** to the course email specifying how many days extension you are requesting.
- If your desired accommodation is **outside the scope** of your Accommodation Letter (e.g. your letter includes “extensions of up to 7 days” but you need more time than that):
 1. **Contact your AccessAbility consultant** and have them email the course email detailing the accommodations required.

Accommodation Procedure:

After submitting your documentation, you will receive a response from your instructor or TA. This form does not guarantee that you will be accommodated. 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. **You are responsible for checking your official U of T email and Quercus course announcements daily**, as accommodations may be time critical.



For missed assignments, **do not wait for the instructor's response to resume work on your assignment.** Extensions may be as short as one business day, depending on the nature of the illness/emergency. Complete your assignment as soon as you're able, and email it to your instructor.

For an **anticipated absence** (e.g. a scheduled surgery or an illness with a prolonged recovery period), if you would like to request accommodations in advance, submit a [Verification of Illness Form](#) completed by your doctor AND the [Request for Missed Term Work Accommodations Form](#) to the course email. Absences can be declared up to 14 days into the future on ACORN.

Missed Accommodations

If an accommodation is granted but a continued illness/emergency prevents you from meeting its requirements, you must repeat the missed term work procedure to request additional accommodations. **Please make it clear in your subject line that you are requesting a second accommodation.** E.g. If you are given an extension but are still sick and need more time, or if you miss a make-up term test, you must submit *another* [Request for Missed Term Work Accommodations Form](#) and declare your extended absence on ACORN. *Note: In the case of a missed make-up test, an opportunity to write a second make-up test may not necessarily be provided.

6.3 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/>.

6.4 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.

6.5 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."

6.6 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.

6.7 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.

Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation web site (<https://uoft.me/pdt-faq>).

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/>).

6.8 Disability-Related Accommodations

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 (<http://www.utscc.utoronto.ca/ability/>) as soon as possible.

AccessAbility Services staff (located in Rm AA142, Arts and Administration Building) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. Please contact 416-287-7560 (tel/TTY) or email ability.utscc@utoronto.ca for more information.

The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.



6.9 Equity, Diversity, Inclusion

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.

6.10 Masks in the Classroom

While the mask mandate has been paused as of 1 July 2022, the use of medical masks continues to be strongly encouraged at U of T Scarborough in indoor settings where physical distancing is not possible. We ask everyone to respect each other's decisions, comfort levels, and health needs.