NROC63
BEHAVIOURAL NEUROSCIENCE LABORATORY
UNIVERSITY OF TORONTO SCARBOROUGH
WINTER 2023

Instructor: **Dr Rutsuko Ito**   **Teaching Assistants:** **Tanner McNamara**
Jeff Kates
 Shukkiththa Sivapatham
Norman Stewart

Lectures: Friday 10am-12pm, SW316
Office hour : **Thursdays 3-4pm**
Communication:
Quercus: For all class content, including announcements, lectures, video recordings, etc.
E-mail: Please use nroc63rats@gmail.com for non-content related queries, including submission of late term work documents.
Slack channel: For class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. You will receive an invitation to join the slack channel in the first week of term.

COURSE OVERVIEW

The Neuroscience laboratory course is an interactive, discussion based upper-level course for the Behavioural Neuroscience stream in our Neuroscience specialist program, designed to teach research techniques that are commonly used in behavioural/systems neuroscience to students who will go on to post-graduate study in a neuroscience related field. The students will learn about widely used behavioural techniques ranging from operant boxes (reward conditioning) to mazes (e.g., elevated plus maze), as well as brain manipulation and histological procedures. Students will also acquire skills in the areas of research design, data analysis, literature review, critical thinking and research writing.

SPECIAL NOTE: Due to recent changes in the University pedagogical review process for courses with live animals, this course will regrettably NOT be able to operate as per pre-COVID, with a fully hands on experience.

In addition, minor changes to the syllabus may have to be made during the term, in response to changing circumstances as the pandemic evolves, and provincial and university regulations change. You will be notified of these changes as they become available.

COURSE INSTRUCTOR

Dr Ito is an Associate Professor in the Department of Psychology at UTSC. She obtained her PhD in Behavioural Neuroscience from the University of Cambridge, UK, and conducted postdoctoral research at the University of Oxford, prior to her appointment at U of T. She has over 20 years' research experience in the field of behavioural neuroscience, and her research interests include the investigation of the neural circuit basis of motivated behaviour and decision-making under the control of salient cues in the environment in the healthy and diseased brain (e.g., addiction, anxiety). Outside of work, Dr Ito enjoys spending time with family, travelling, eating, swimming, playing the piano and hiking.

Course pre- and co-requisites

Prerequisite:
The content of this course will be heavily based on the theoretical constructs covered in
NROC61H3 Learning and Motivation and NROC69H3 Synaptic Organization and Physiology of the Brain.
Corequisite:
The completion of PSYC08H3 Advanced Data Analysis in Psychology would be advantageous in understanding the course material.

Course Objectives

By the end of the course:
- You will have working knowledge of relevant research literature and ethical issues in the use of animal models
- You will have working knowledge of how a research project in behavioural neuroscience is designed and conducted
- You will have advanced knowledge of research methods, behavioural and protein detection techniques in neuroscience
- You will have learned tools for data analysis and data presentation
- You will have practiced writing a complete scientific manuscript

Tentative Course Outline

Date	Lecture	Lab	Assignments
Jan 13	**Course Introduction**		☛*Watch, and complete animal ethics rat handling training online* ***Complete by 20th Jan 11.59pm***
Jan 20	**Principles of Experimental Design**		☛*Conduct literature search and submit a report of two papers that successfully induced inhibitory learning* ***(10%).*** ***Due 26th Jan 11.59pm*** ☛**Read** *'Considerations for Experimental Design of Behavioral Studies Using Model Organisms'. J Neurosci 39:1-2*
Jan 27	**From theory to practice: Designing Experiment 1**	Vivarium Orientation and operant box training (23rd-27th)	☛**Read** *'AUP 20012645 Investigating the neural substrates of conditioned inhibition'*
Feb 3	**Research methods in behavioural neuroscience & Testing Anxiety**	CI training (30th – 3rd Feb) **Anxiety test demo**	☛**Read** *'Behavioural Neuroscience Research Tools'*
Feb 10	**Review of Results/ Writing the Introduction and Methods**	Summation training (6-10th)	☛***Complete online quiz (10%)*** ***Due 16th February 11.59pm***
Feb 17	**From theory to practice: Experiment 2 Cell counting using** *Fiji/Image J*	Summation training (13-16th)	
Feb 24	**Reading Week**		

		Retardation training (run by TAs only)	👉**Introduction & Methods (15%)** *Due 27th February 11.59pm*
Mar 3	**Results/Data presentation/ Statistics** *Use of softwares SPSS & Graphpad Prism*	Retardation training (27th Feb – 1st Mar)	👉**Submit cell count results (10%)** *Due 9th March 11.59pm*
Mar 10	**Review of cell counts**		
Mar 17	**Results/Statistics workshop**		👉**Results & Figures (15%)** *Due 20th March 11.59pm*
Mar 24	**Writing the Discussion**		
Mar 31	**Class presentations – research proposal on follow up experiment**	👉**Group Presentations (10%)**	
Apr 7	**Class presentations – research proposal on follow up experiment**		👉**Final paper (15%)** *Due 10th April 11.59pm*

Resources:

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 Behavioural Neuroscience Laboratory NROC63H3. You may need to scroll through other cards to find this. Click on the Behavioural Neuroscience Laboratory NROC63H3 link to open our course area, view the latest announcements and access your course resources. There are Quercus help guides 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.

Group work:
You will be working in automatically assigned groups during this course, which is designed to enhance your learning experience:

EVALUATION

There are no in-person exams for this course. Instead, grading will be based on the following categories of assignments.

1. **Research Paper (45% +10% lit search)**
   Your final paper should be written according to the specific guidelines of the Journal of Neuroscience:
   https://www.jneurosci.org/content/information-authors#preparing_a_manuscript

   Some brief guidelines are provided below, but you must read the detailed guidelines online. All assignments must be submitted to **the appropriate assignment folders in Quercus by 11.59pm on the specified dates.**

   To make paper writing more of a training process than one big assignment that has to be handed in at the end, the paper writing will be broken down into the following components. You will be provided with feedback on your assignments, *which you are expected to use to improve your writing for the final paper.* Please note that due to the tight submission timeline of various components of the paper, a late submission of assignments will lead to a delay in getting your feedback or no feedback at all.

   Literature search (10%) – due Jan 26
   You will conduct a literature search, and **find two papers in which rats (or mice if justifiable)** underwent inhibitory learning, and provide a report of the task design and parameters used, as well as the findings of the paper (including details of neural substrates explored, if applicable). You will be provided with a guided document entitled '**Literature Search and Experiment Preparation**' that you will need to fill out for this assignment, and you are to upload this document on Quercus, and email the Title and pubmed ID number of your chosen papers to the course email address (nroc63rats@gmail.com) by the deadline (**26th Jan**). *Late work cannot be accepted for this document (i.e., you will earn 0% if no work is handed in) as the outcome of your search will be the basis of our discussion in class on the 27th.*

   Introduction and Materials and Methods (15%) – due Feb 27
   The Introduction should be a maximum of **650 words** in length. A lengthy review of the topic is discouraged, and the introduction must contain a **clear, concise and relevant background** of the research (*Exp 1only*) and a **rationale** for the study.

   The Methods section must contain a description of the materials and experimental procedures (Exp 1).

   Results and Figures (15%) - due Mar 20
   You will run statistical analyses of the data compiled from behavioural video scoring and cell counting, and write up the Results section and provide appropriate Figures of all the data collected.

   Final Paper (15%) – due Apr 10
   The final paper should contain the following sections:

   Title Page (NB this is slightly different from the requirements of J Neuroscience:
   ❖ Title (50-word maximum)
   ❖ Abbreviated title (50-character maximum)
   ❖ Author name – *just your name*
   ❖ Number of pages
   ❖ Number of figures, tables, multimedia, and 3D models (separately)
   ❖ Number of words for abstract, introduction, and discussion (separately)

   Abstract: should clearly state the background, rationale, brief procedures and results of the paper, and should not exceed 250 words.
   Introduction: as above

Materials and Methods: as above and '*EXPERIMENTAL DESIGN AND STATISTICAL ANALYSES*' section as per the guidelines online**.**

Results: This section should report statistical analyses of **all the data** collected.

Discussion (max 1000 words): This section should have a concise, brief discussion of the data in the context of extant literature. There should be a concluding paragraph highlighting the main conclusions, limitations of the study, as well as referring to future direction of research.

References: List the references you cite in the text in alphabetical order (by the first authors' surnames).

Figure Legends: This section must provide a brief description of the figures in the order they are referred to in the text. For specific formatting requirements, refer to the published guidelines from the Journal of Neuroscience

Figures: The figures should appear at the end of the paper, in sequential order.

PLAGIARISM DETECTION TOOL

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 website (https://uoft.me/pdt-faq).

2. **Lab Performance (22.5%)**
   Attendance will be taken for each lecture, as important information pertaining to the assignments/experiments will be discussed in each of these classes. Please be advised that you will need to *spend time outside of the scheduled 2hr lecture time* to conduct the **lab component** of the course, which will consist of taking turns to **help in the behavioural testing of rats learning to acquire conditioned inhibition as detailed in the Lab Manual (but please note that you will not be able to directly handle the animals).** You will also learn to conduct cell counting of images taken from the brains of animals that have undergone behavioural training (due **Mar 9**).

3. **Online quiz (10%) – due Feb 16**
   Instead of a structured exam, you will complete a guided online quiz, in which you will demonstrate your understanding of the AUP, experimental design, anxiety test data scoring and data interpretation.

4. *Group presentation (10%)* – **Mar 31 & 7 Apr**
   You will prepare a group presentation (15min + 5 min question time) in your group of 4, in which you will **outline a research proposal of a follow up experiment**, in order to address any deficiencies of the experiments conducted in this class. Your research proposal should be novel and plausible, and designed according to the principles of good experimental design that you have learned in the course. A brief guideline will be provided on Quercus.

5. **Class/Online discussion participation (2.5%)**
   Great science is birthed and cultivated in a highly interactive and collaborative environment, where ideas are shared and discussed. I will pose some open-ended questions throughout the course that I would like you to discuss in class, and on Slack. You are encouraged to participate in these discussions as much as possible, but will be graded for the quality of your individual contributions.

6. Course Policies

Online Rat module and Animal handling training: to be completed by 20th January
The completion of the online rat module and the animal handling training, and understanding of the animal used protocol is a mandatory requirement for proceeding with this course.

Late Assignments
All late assignments will be accepted with a **penalty of 5% per day**, up until the third day after the assignment is due in. All assignments are due by 11.59pm (midnight) on the due date.

Contesting a grade
All requests for a re-grade must be submitted **in writing** within one week 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 (e.g., "I need to get into med school, so could you please give me a higher grade?").**

Video and Audio 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."

Copyright of lecture material
As protection of copyright, unauthorized copying, use, or uploading on www of any of the lecture slides, lab manuals and protocols produced by Professor Ito is strictly prohibited.

Psychology Department Missed Term Work Policy

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 NROC63 is: nroc63rats@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.

Grading

Scale

NUMERICAL MARKS	LETTER GRADE	GRADE POINT VALUE
90 - 100%	A+	4.0
85 - 89%	A	4.0
80 - 84%	A-	3.7
77 - 79%	B+	3.3
73 - 76%	B	3.0
70 - 72%	B-	2.7
67 - 69%	C+	2.3
63 - 66%	C	2.0
60 - 62%	C-	1.7
57 - 59%	D+	1.3
53 - 56%	D	1.0
50 - 52%	D-	0.7
0 - 49%	F	0.0

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/.

AccessAbility statement:
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 as soon as possible.

AccessAbility Services staff (located in Rm SW302, Science Wing) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations 416-287-7560 or email ability@utsc.utoronto.ca. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

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/Assets/Governing+Council+Digital+Assets/Policies/PDF/ppjun011995.pdf) 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; and
- When you knew or ought to have known you were doing it.
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; and
- When you knew or ought to have known you were doing so.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If students have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, they are

expected to seek out additional information on academic integrity from their instructors or from other institutional resources.

<u>Note:</u>

You may see advertisements for services offering grammar help, essay editing and proof-reading. Be very careful. If these services take a draft of your work and significantly change the content and/or language, you may be committing an academic offence (unauthorized assistance) under the *Code of Behaviour on Academic Matters.*
It is much better and safer to take your draft to the Writing Centre as early as you can. They will give you guidance you can trust. Students for whom English is not their first language should go to the English Language Development Centre.
If you decide to use these services in spite of this caution, you <u>must</u> keep a draft of your work and any notes you made before you got help and <u>be prepared to give it to your instructor on request.</u>

Religious Accommodations
The University has a commitment concerning accommodation for religious observances. I will make every reasonable effort to avoid scheduling tests, examinations, or other compulsory activities on religious holy days not captured by statutory holidays. According to University Policy, if you anticipate being absent from class or missing a major course activity (like a test, or in-class assignment) due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two to three weeks), so that we can work together to make alternate arrangements.

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.

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. Masks are available at all building entrances at U of T Scarborough and in all classrooms.