

NROC63

BEHAVIOURAL NEUROSCIENCE LABORATORY

UNIVERSITY OF TORONTO SCARBOROUGH

WINTER 2022

Instructor: Dr Rutsuko Ito

TAs: Sandeep Dhawan, Tanner McNamara

Lectures: **Friday 10am-12pm on Zoom** (Jan 14-29, Feb 25, Mar 18), **SW403** (the rest)

Office hours: By appointment only on **Thursdays between 3-4pm, and open to all 4-5pm**

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.

Piazza: For class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Please post content-related questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

Find our class page at: <http://piazza.com/utoronto.ca/winter2022/nroc63h3slec01/home>

COURSE OVERVIEW

The Neuroscience laboratory course is a 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, with the use of video recordings of live sessions (for the 2022 course offering). 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 guidelines for course delivery, this course will be offered in a hybrid in person/online format. All lectures will be synchronous. Please note that regrettably, students will NOT have the opportunity to gain hands-on experience in this course this year, due to the restrictions and protocols in place to minimize the transmission of Covid-19 in the vivarium facility.

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, 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 14	*Course Introduction		<ul style="list-style-type: none"> 👉 Watch, and complete animal ethics rat handling training online Complete by 20th Jan 11.59pm
Jan 21	*Principles of Experimental Design		<ul style="list-style-type: none"> 👉 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'. <i>J Neurosci</i> 39:1-2
Jan 28	**From theory to practice: Designing Experiment 1	Conduct video scoring of live CI experiments.	<ul style="list-style-type: none"> 👉 Read 'AUP 20012645 Investigating the neural substrates of conditioned inhibition'
Feb 4	Research methods in behavioural neuroscience & Testing Anxiety	If restrictions lift, we will conduct a live tour of the vivarium in small groups	<ul style="list-style-type: none"> 👉 Read 'Behavioural Neuroscience Research Tools' and discuss open-ended questions on Piazza throughout the term. 👉 Submit cue learning, summation and retardation test data (10%) Due 8th Feb 11.59pm
Feb 11	Review of Results/ Writing the Introduction and Methods		<ul style="list-style-type: none"> 👉 Submit the DREADDs experiment assignment (10%) Due 20th February 11.59pm

Feb 18		Reading Week	
Feb 25	**From theory to practice: Experiment 2	Immunohistochemistry Cell counting using Fiji/Image J	👉 Introduction & Methods (15%) <i>Due 27th February 11.59pm</i>
Mar 4	Results/Data presentation/ Statistics		👉 Submit cell count results (10%) <i>Due 6th March 11.59pm</i>
Mar 11	Review of cell counts		
Mar 18	**Results/Statistics workshop		👉 Results & Figures (15%) <i>Due 20th March 11.59pm</i>
Mar 25	Writing the Discussion		
Apr 1	Class presentations – research proposal on follow up experiment	👉 Group Presentations (10%)	
Apr 8	Class presentations – research proposal on follow up experiment		👉 Final paper (15%) <i>Due 10th April 11.59pm</i>

*These classes will be conducted **on Zoom**,

These classes will be conducted **on Zoom, and involve time with smaller, breakout groups led by the TAs.

In-person classes:

It is hoped that classes will transition to 'in-person' delivery in February. Please note that current university policies require face masks to be worn, and full vaccination for class attendance.

Face masks: <https://www.provost.utoronto.ca/planning-policy/joint-provostial-and-human-resources-guideline-on-facemasks-at-the-university-of-toronto/>

Vaccines: <https://www.utoronto.ca/utogether/vaccines>

Further information about any additional requirements will be provided as we approach the transition to in-person, based on the latest provincial guidelines and any related updates to the university's response to COVID-19.

Resources:

Lecture slides and links to documents and papers for assigned reading will be posted on Quercus **by midnight at the latest** the night before the lecture.

Group work:

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

Breakout groups – The class will be divided into 2 groups as determined by the first letter of your surname. You will receive further instructions on video scoring/cell counting, and work on questions posted in Piazza in these groups. Each group will be assigned 1 TA.

Assignment groups (see Quercus for the group you're in) – You will work in groups of 4-5 to complete two assignments in the course: Guided quiz and Group presentation (see below for details).

EVALUATION

There are no 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 28th.*

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 (Exps 1&2) and a **rationale** for the study.

The Methods section must contain a description of the materials and experimental procedures (up to and including 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, but now including the immunohistochemistry methods (Exp2), 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.

Please note that all assignments submitted on Quercus will be assessed by a plagiarism detection program (now called Ouriginal), which is a tool that assists in detecting textual similarities between compared works (which includes past student work). Any similarity score/index of >25% will be investigated.

2. Lab Performance (20%)

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 **data scoring, filling out and submitting an excel data sheet by the stated deadlines (Feb 8th, Mar 6th)**. More specifically, you will score videos taken from live sessions of behavioural testing (conditioned inhibition), and conduct cell counting of images taken from the brains of animals that have undergone behavioural training.

3. **DREADDs experiment guided quiz (10%) – due 20th February

Instead of a structured exam, you will complete a guided quiz, in which you will demonstrate your understanding of experimental design, anxiety test data scoring and data interpretation.

****You can work with your groups of 4 on this assignment (share video scoring duties and discuss answers to questions), but you MUST complete the quiz individually, and answer in your own words.**

4. *Class/Piazza participation (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 Piazza. You are encouraged to participate in these discussions as much as possible, but will be graded for the quality of your individual contributions.

5. **Group presentation (10%) –Apr 1&8

You will prepare a group presentation (15min + 5 min question time) in your group of 4-5, 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.

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.

In the event of COVID-related disruptions

Please email us (nroc63rats@gmail.com) with the completed self-declaration form on ACORN (see details below) if you contract COVID, and require accommodations for missing an assignment deadline. If classes need to be missed, recorded lectures will be made available via Quercus.

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, WINTER 2022

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

- 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: <http://www.utoronto.ca/registrar/missing-examination>
- 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.utoronto.ca/registrar/term-work>

Accommodations for Illness or Emergency:

For missed work due to ILLNESS OR EMERGENCY, complete the following **three-step** process:

1. Complete the [Request for Missed Term Work Accommodations Form](#)

2. **Declare your absence** on [ACORN](#) (Profile & Settings > Absence Declaration)
3. Email both the Request for Missed Term Work Accommodations Form **AND** a screenshot of your Self-Declared Absence on [ACORN](#) to the course email address nroc63rats@gmail.com **WITHIN 2 BUSINESS DAYS** of the missed work.

Note: If you are unable to submit your documents within 2-business days, **you must still email your instructor within the 2-business day window** to explain the nature of the delay, and when you will be able to provide your documents. Exceptions to the documentation deadline will only be made under **exceptional circumstances**.

Note: For this semester, we do not require any additional supporting documentation (e.g. medical notes) to support your missed term work accommodation request.

Accommodations for Academic Conflicts:

For missed term work due to an ACADEMIC CONFLICT (i.e. two midterms scheduled at the same time), please complete the following process:

1. Complete the [Request for Missed Term Work Accommodations Form](#), choosing “Other” and explaining the conflict in the space provided.
2. Take screenshots of your course homepages that demonstrate the conflict.
3. Email the form and screenshots to your course instructor **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.

Note: Multiple assignments due on the same day are not considered conflicts. Accommodations may only be possible in the case of quizzes and tests that are both scheduled during the same discrete period. Back-to-back tests/quizzes are not considered conflicts.

Note: Students are responsible for keeping their course timetables conflict-free. Students who choose to register in two synchronous courses with overlapping lecture/tutorial/lab schedules will not be accommodated.

Accommodations for Religious Conflicts:

For missed term work due to a RELIGIOUS CONFLICT, please complete the following process:

1. Complete the [Request for Missed Term Work Accommodations Form](#), choosing “Other” and noting “Religious conflict” in the space provided.
2. Email the form to your course instructor **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.

Accommodations for Students Registered with AccessAbility Services:

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

- **Contact your AccessAbility consultant** and have them email your instructor 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 your instructor, 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 your instructor 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 for accommodation. **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 an instructor response to resume work on your assignment**. Extension accommodations may be as short as one business day, depending on the nature of the illness/emergency. You should complete your assignment as soon as you are able and email it your instructor.

For an anticipated event (e.g. scheduled surgery or an illness with a prolonged recovery period), submit a [Verification of Illness Form](#) completed by your doctor, AND this form to your instructor if you would like to request accommodations in advance of the assignment deadline or midterm date. **Declare your future absence on ACORN (absences can be declared up to 14 days in the future).**

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. **Please make it clear in your subject line that you are requesting a second accommodation.** For example, if you are given an extension but are still sick and need more time, or if you miss a make-up midterm, you must submit another request '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 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](tel: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.

Note:

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 must keep a draft of your work and any notes you made before you got help and be prepared to give it to your instructor on request.