NROC63
Behavioural Neuroscience laboratory
University of Toronto Scarborough
Winter 2025

Instructor: **Dr Rutsuko Ito** **Teaching Assistants:** **Jeffrey Kates & Ross Stewart**

Lectures: Thursday 12pm-2pm, SW316
Office hour : **Fridays 12-1pm, SW627**
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 TAs, 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 experiential, 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.

Course instructor

Dr Ito is a 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:
BIOB10H3 and NROB60H3 and NROB61H3 and PSYB55H3 and PSYB70H3 and [PSYB07H3 or STAB22H3]
Corequisite:
The content of this course will be heavily based on the theoretical constructs covered in NROC61H3 Learning and Motivation

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 demonstrate competency in administering a number of commonly used hands-on behavioural techniques (e.g., pavlovian and instrumental conditioning, elevated plus maze)
- 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 rigorously.
- 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

** Timeline of lab work is subject to change due to unforeseen factors that may arise during live animal experiments.*

Date	Lecture	Lab	Assignments
Jan 9	**Course Introduction**		*Watch, and complete animal ethics rat handling training online* ***(2.5%)*** ***Complete by 16th Jan 11.59pm***
Jan 16	**Principles of Experimental Design**		*Conduct literature search and submit a report of two papers that successfully induced pavlovian to instrumental transfer* ***(10%).*** ***Due 22nd Jan 11.59pm*** **Read** *'Considerations for Experimental Design of Behavioral Studies Using Model Organisms'. J Neurosci 39:1-2*
Jan 23	**From theory to practice: Designing Experiment 1**	**Vivarium Orientation and handling training** (20th-24th Jan)	**Read** *'AUP 20013061*
Jan 30	**Research methods in behavioural neuroscience & Testing Anxiety**	**Instrumental training** Week 1 (27th -31st Jan)	**Read** *'Behavioural Neuroscience Research Tools'*
Feb 6	**Review of Results/ Writing the Introduction and Methods**	**Instrumental training** Week 2 (3-7th Feb)	
Feb 13	**In class Quiz**	**Pavlovian training** (10-14th Feb)	
Feb 20	**Reading Week**	**PIT Test** ***To be run by TAs only***	**Introduction & Methods (15%)** ***Due 24th February 11.59pm***

Feb 27	**Anxiety Test Demo during class**		
Mar 6	**Results/Data presentation/ Statistics** ***Use of softwares SPSS & Graphpad Prism***	**Anxiety Tests** (3-5th Mar)	
Mar 13	**Results/Statistics continued**		**Results & Figures (15%)** ***Due 17th March 11.59pm***
Mar 20	**Writing the Discussion**		
Mar 27	**Class presentations – research proposal on follow up experiment**	**Group Presentations (10%)**	
Apr 3	**Class presentations – research proposal on follow up experiment**		**Final paper (15%)** ***Due 4th 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 22
You will conduct a literature search, and **find two papers in which rats** underwent pavlovian to instrumental transfer, 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 (**22nd 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 23rd.*

Introduction and Materials and Methods (15%) – due Feb 24
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 and a **rationale** for the study.

The Methods section must contain a description of the materials and experimental procedures.

Results and Figures (15%) - due Mar 17
You will run statistical analyses of the data collected in the operant boxes, and write up the Results section and provide appropriate Figures of all the data collected (you do not need to include the anxiety test data).

Final Paper (15%) – due Apr 4
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%)**
Online Rat module and Animal handling training (2.5%): to be completed by Jan 16
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.

You will *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 pavlovian and operant learning as detailed in the Lab Manual. Attendance of lab demonstrations is mandatory, as you will receive important instructions and training in administering the behavoiural tests. Following training,** you will be rostered to conduct ~2 testing sessions per week for a period of 3 weeks (in operant testing), and 1 lab session on 1 week (for anxiety tests).

3. **In class quiz (10%) – Feb 13**
You will complete an open book quiz, in which you will demonstrate your understanding of the AUP, experimental design, and data interpretation.

4. **Group presentation (10%) – Mar 27 & Apr 3**
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 attendance and discussion participation (2.5%)**
Attendance of lectures is mandatory, as important information pertaining to the assignments/experiments will be discussed in each of these classes (1.25%). Great science is birthed and cultivated in a highly interactive and collaborative environment, where ideas are shared and discussed. You are encouraged to participate in these in-class discussions as much as possible, and will be graded for the quality of your individual contributions (1.25%).

6. Course Policies

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.

University's 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 web site (https://uoft.me/pdt-faq).

Generative Artificial Intelligence (AI) Tools
Students may not, under any circumstance, submit any writing (copied or paraphrased) generated by an AI-based tool as their own for the purpose of completing assignments in this course. If you include material generated by an AI-based tool, it will be treated as plagiarism.

Department of Psychology Missed Term Work Policy

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

Procedure:

1. Complete the Request for Missed Term Work Accommodations Form ("MTW Form").

2. Email **BOTH** your MTW Form and Supporting Documentation to **nroc63rats@gmail.com** according to the instructions specified below.

Supporting Documentation Requirements and Deadlines:

<table>
<tr><th>Reason for Missed Work</th><th>Documentation required for a first absence in the term</th><th>Documentation required for subsequent absences in the term</th><th>Deadline for submitting MTW form and supporting documentation</th></tr>
<tr><td>Illness or Injury</td><td>ACORN Absence Declaration</td><td>UofT Verification of Illness Form</td><td>WITHIN 2 BUSINESS DAYS of the missed work</td></tr>
<tr><td>Bereavement</td><td>ACORN Absence Declaration</td><td>A death certificate or funeral announcement</td><td>WITHIN 2 BUSINESS DAYS of the missed work</td></tr>
<tr><td>University-sponsored athletic or artistic obligation at the varsity/provincial/national level</td><td>ACORN Absence Declaration</td><td>A note from a university staff member (advisor, coach, residence staff, etc.) who can substantiate the obligation, sent directly to the course email</td><td>10 BUSINESS DAYS IN ADVANCE of the missed deadline</td></tr>
<tr><td>Disability-related reasons for students registered with AccessAbility Services</td><td colspan="2">For missed TERM TESTS,
- Contact your AccessAbility consultant and have them write to the course email detailing the accommodations needed.
For missed ASSIGNMENTS,
- 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), send your Accommodation Letter to the course email and specify 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), contact your AccessAbility consultant and have them write to the course email detailing the accommodations needed.</td><td>PREFERABLY IN ADVANCE OF THE MISSED WORK, OR AS SOON AS POSSIBLE</td></tr>
<tr><td>Academic Conflict
(e.g. two midterms at the same time)</td><td colspan="2">Screenshot from Quercus demonstrating the conflict.</td><td rowspan="2">10 BUSINESS DAYS IN ADVANCE of the missed work</td></tr>
<tr><td>Religious Conflict</td><td colspan="2">None required</td></tr>
</table>

Notes:

- The following reasons are not considered sufficient for missed term work: social activities, recreational travel, technological issues, avoidance of assessments or deadlines, work commitments
- Missed Final Exams are handled by the Registrar’s Office and should be declared on eService.

- For ACORN absence declarations, the date you declare the absence is required to fall within the seven-day declaration period (i.e.) the absence cannot be submitted proactively or retroactively.
- 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.
- If you are unable to submit your request within the specified number of business days, you must still email your instructor within that window to explain the nature of the delay. Exceptions to the deadlines are made only under exceptional circumstances.
- Multiple assignments due on the same day are not considered academic conflicts. Students are expected to manage their time effectively to meet assignment deadlines.
- Back-to-back tests/quizzes are not considered academic 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.

Next Steps:

After submitting your documentation, you will receive a response from your instructor or TA. The course instructor reserves the right to decide what accommodations 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.

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.** Examples: If you were granted an extension for a paper but are still unable to meet the new deadline, or if you miss a make-up term test, you must submit *another* MTW form and supply documentation according to the "subsequent absences" column in the chart above. *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/.

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 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 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
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 in papers and assignments include 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, cheating includes using or possessing unauthorized aids, looking at someone else's answers during an exam or test, misrepresenting your identity, or falsifying or altering any documentation required by the University.

Equity, Diversity and 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.
The University of Toronto is a richly diverse community and as such is committed to providing an environment free of any form of harassment, misconduct, or discrimination. In this course, I seek to

foster a civil, respectful, and open-minded climate in which we can all work together to develop a better understanding of key questions and debates through meaningful dialogue. As such, I expect all involved with this course to refrain from actions or behaviours that intimidate, humiliate, or demean persons or groups or that undermine their security or self-esteem based on traits related to race, religion, ancestry, place of origin, colour, ethnic origin, citizenship, creed, sex, sexual orientation, gender identity, gender expression, age, marital status, family status, disability, receipt of public assistance or record of offences.

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.