

# *Advanced Neuroscience Laboratory*

**NROD63H3 2014**

**(Tue 5:00pm - 8:00pm)**

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## **Course Description:**

This course is designed to introduce students to a variety of neuroanatomical techniques and histochemical procedures used in behavioural neuroscience that permit scientists to link neurobiology with function and behaviour. The course will offer students in-depth training on how to navigate a brain atlas in order to identify neural regions of interest, and will provide demonstrations of how brain atlases can serve as powerful tools for many different applications in behavioural neuroscience. In addition, students will learn about the theory and methodology of several histochemical procedures that permit assessments of neural structure and/or function at different levels of analysis, including neuronal morphology, and gene and protein expression. As a major component of the laboratory exercises, students will learn how to analyze sets of tissue sections that have been prepared using the different histochemical procedures.

## Course Materials:

1. All students are required to purchase the following (available at UTSC bookstore):  
Paxinos, G. & Watson, C. "The Rat Brain in Stereotaxic Coordinates: Compact 6<sup>th</sup> Edition", Academic Press, 2008.
2. All students are required to set up a Dropbox account for transferring of electronic materials.
3. Assigned readings will be posted as PDF files on Blackboard.

## Course Components and Evaluation:

### Summary of Evaluation

	Percentage of final grade
Laboratories (3 in total)	30% (10% each)
Term Tests	40% (20% each)
Final exam	30%

### Description of course components

#### *1. Laboratories*

Students will be required to complete 3 laboratory assignments over the course of the term.

- ✓ In Lab 1, students will become familiar with how to use the rat brain atlas as a tool for performing neuroscience research techniques including performing stereotaxic surgery and guiding tissue sectioning.
- ✓ In Lab 2, students will work with image sets of neurons that have been traced from tissues processed with Golgi-Cox stain, and will learn how to use a computer software program ("ImageJ") to analyze various attributes of cell morphology.
- ✓ In Lab 3, students will work with sets of autoradiographs obtained from tissue sections processed for in situ hybridization, and learn how to perform densitometry to determine levels of gene expression in specified brain regions.

Each laboratory will consist of a set of exercises that students will be required to complete. PDF files containing the background and instructions necessary to complete the exercises will be provided in class (Lab1) or posted on the intranet (Lab 2 and 3); in addition, students will be given in-class instruction on all components of these assignments.

## 2. *Term Tests*

Two term tests will be given during class time (see schedule below). The tests will consist of multiple choice and short answer questions. Questions will include those with a focus on theory, as well as application and problem-solving.

## 3. *Final Exam*

The final exam will be scheduled during the exam period and consist of a series of short answer questions with a focus on theory, application, and problem-solving. *The final will be cumulative.*

## **Overview of Lecture, Lab, and Tutorial Schedule:**

The following table presents the schedule of lectures, labs, and tutorials, as they will occur over the course of the term, and the due dates for assignments. There are a number of items to be noted in reviewing this schedule:

- All classes (Lectures, labs, tutorials) are scheduled for Tuesday.
- Locations for the various lectures, labs, and tutorials will change from week to week. Majority of class are to be held at SW316. *Please be sure to stay updated with blackboard announcements each week before coming to class, so that you arrive at the right place at the right time!*
- All laboratory assignments are due at the start of the class hour indicated in the schedule below. Please submit printed copies of all lab reports. Electronic materials are to be submitted before class by uploading onto your Dropbox folder.

## 2014 NROD63 Schedule:

Week	Lecture/Lab content (TUE)	Reminder
1 Jan 7th	<p><i>Agenda :</i></p> <ul style="list-style-type: none"> <li>★ Course Content</li> <li>★ Objectives</li> <li>★ Methods of Evaluation</li> <li>★ Dropbox set-up reminder</li> <li>★ Lecture - Overview of methods in behavioural neuroscience</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Please bring printout of lecture</li> <li><input type="checkbox"/> Check out readings (if available)</li> </ul>
2 Jan 14th	<p><i>Agenda:</i></p> <ul style="list-style-type: none"> <li>★ Lecture</li> <li>★ Basic research methodologies</li> <li>★ Introduction to brain atlas</li> <li>★ Brain structure recap</li> <li>★ Practice exercise for brain atlas</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Please bring printout of lecture</li> <li><input type="checkbox"/> Check out readings (if available)</li> </ul>
3 Jan 21st	<p><i>Agenda:</i></p> <ul style="list-style-type: none"> <li>★ Lecture</li> <li>★ Introduction to Stereotaxy</li> <li>★ Introduction to Tissue sectioning</li> <li>★ Tissue sectioning calculation basic concepts</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Please bring printout of lecture</li> <li><input type="checkbox"/> Check out readings (if available)</li> <li><input type="checkbox"/> Start on Lab 1 experimental design assignment</li> </ul>
4 Jan 28th	<p><i>Agenda:</i></p> <ul style="list-style-type: none"> <li>★ Lab 1: Tissue sectioning lab</li> <li>★ In class exercise stations</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Please be on time – in class exercise to be completed</li> <li><input type="checkbox"/> Check out readings (if available)</li> <li><input type="checkbox"/> Submission of Lab 1 (experimental design assignment from previous week and in-class exercise materials)</li> </ul>
5 Feb 4th	<p><i>Agenda:</i></p> <ul style="list-style-type: none"> <li>★ Term Test 1</li> </ul>	
6 Feb 11th	<p><i>Agenda:</i></p> <ul style="list-style-type: none"> <li>★ Lecture</li> <li>★ Introduction to Cell Morphology</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Please bring printout of lecture</li> <li><input type="checkbox"/> Check out readings (if available)</li> </ul>
Feb 18th	<b><i>READING WEEK</i></b>	
7 Feb 25th	<p><i>Agenda:</i></p> <ul style="list-style-type: none"> <li>★ Lab 2: Cell Morphology lab</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Please review and bring lab instructions</li> </ul>

<p><b>8</b> <b>Mar 4th</b></p>	<p><i>Agenda:</i></p> <ul style="list-style-type: none"> <li>★ Lecture</li> <li>★ Methods for Studying gene and protein expression</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Please bring printout of lecture</li> <li><input type="checkbox"/> Check out readings (if available)</li> <li><input type="checkbox"/> Submission of Lab 2: cell morphology lab</li> </ul>
<p><b>9</b> <b>Mar 11th</b></p>	<p><i>Agenda:</i></p> <ul style="list-style-type: none"> <li>★ Lab 3: Densitometry lab</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Please review and bring lab instructions</li> </ul>
<p><b>10</b> <b>Mar 18th</b></p>	<p><i>Agenda:</i></p> <ul style="list-style-type: none"> <li>★ Term Test 2</li> <li>★ Extra TA support for Densitometry lab after term test (if needed)</li> </ul>	
<p><b>11</b> <b>Mar 25th</b></p>	<p><i>Agenda:</i></p> <ul style="list-style-type: none"> <li>★ Lecture</li> <li>★ Principles of RNA/DNA probe design</li> <li>★ In class practice exercise participation</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Please bring printout of lecture/exercise</li> <li><input type="checkbox"/> Check out readings (if available)</li> <li><input type="checkbox"/> Submission of Lab 3: cell morphology lab</li> </ul>
<p><b>12</b> <b>Apr 1st</b></p>	<p><i>Agenda</i></p> <ul style="list-style-type: none"> <li>★ Course Wrap-up and Review</li> <li>★ Time for questions</li> <li>★ Extra TA support</li> </ul>	