Psych 3FA3: Neurobiology of Learning and Memory  
(2020-2021, Term 1)

Instructor:  
Dr. Hongjin Sun,  
email: sunhong@mcmaster.ca (include “3FA3” in the subject heading of your email)

TAs:

Weekly Schedule:  
Class Time Slots  
• Monday, 2:30-3:20 pm  
• Wednesday, 2:30-4:20 pm  
Tutorial Time Slots (mandatory for the Presentation Groups the week before presentation)  
• Thursday, 3:30-5:20 pm (starting week 4), Presentation Practice  
• Wednesday, 4:30-5:20 pm (starting week 3), Q&A

Office Hour: to be established

Virtual Classroom:  
http://avenue.mcmaster.ca/  
Lectures will be live-streamed during scheduled course times and recorded. These recordings will be made available for review. Details of how to access lectures will be made available at the beginning of the course via Avenue to Learn.

Course Description  
This course will explore empirical and theoretical accounts surrounding the neural basis of learning and memory. Neural mechanisms will be discussed from several perspectives ranging from cognitive neuroscience to synaptic physiology. Students will attain some understanding of the rationale and methodology of a variety of strategies that are used in the investigation of the neural mechanisms underlying learning and memory. The course will start with a historical perspective and an overview of the multiple memory systems. This model emphasizes the fact that memory is composed of multiple, separable systems that are associated with specific neurobiological substrates. A number of brain mechanisms subserving learning and memory at the systems level, cellular level, and molecular level will subsequently be discussed.

The lectures, required and supplementary readings, in conjunction with student discussion/presentations, are meant to provide students with both an overview of some of the currently "hot" areas in the field as well as some basic tools useful for research in this field. Moreover, students are expected, through active learning (discussions, presentations, and written critiques), to gain experience in critically evaluating research literature and in communicating ideas through written and oral presentations.

During 7 of the 13 weeks, introductory material (overview of the field) will be covered in a traditional lecture format. In the remaining 6 of the 13 weeks, for 1 hour only, introductory lectures will be given by the instructor (on Monday) and the remaining two hours (on Wednesday)
will be dedicated to one empirical paper (in the format of student group discussions, class presentations by student groups and instructor feedback for the presentation).

**Overall Contents**

The course includes two learning formats:
- Lecture/Exams
- Analysis of 6 empirical papers: Discussions/Presentations/Critiques

**Reading Materials**

Reading 1 (required): 6 empirical papers (listed in page 4 of this outline)
The textbook by Eichenbaum will provide background information for the lectures.

**Lectures**

Instructor’s lectures will be delivered for total of three hours in 7 of the 13 weeks, and for one or two hours in each of remaining weeks.

Lecture topics:
- History
- Multiple memory systems
- Cortex
- Spatial learning
- LTP

**Discussion/Presentations/Critiques (6 weeks)**

For 6 weeks in the term, the two hours on Wednesday’s classes will be reserved for class presentations (by 2 selected groups, 15-20 x 2 mins) then followed by feedback from the instructor (45 mins).

- **Discussions**: Prior to the class time, for the groups who are not presenting, each group will FINISH UP the discussion of the empirical paper listed for the target module which is scheduled to be formally presented the week NEXT. At the end of the discussion, the GROUP will be required to submit to Avenue a written summary of the issues discussed.

- **Presentations**: Each group will be assigned 2 of the 6 modules for which they will be responsible for giving a formal presentation of the empirical papers to the class (one module as the “primary presenter”, the other module as the “commentator”). Primary presenter will provide description of the study while the commentator will provide critical analysis of the study. For each module, the presentation in class is completed by two groups (one as a primary presenter, the other as a “commentator”).

- **Critiques**: Each student will be required to write critiques for any 2 (one among modules 1-3, the other among modules 4-6) of the 6 modules (but NOT the ones they are presenting in class). The content of the critiques could be discussed during group meetings; however, the critiques must be written INDIVIDUALLY, not as a group.

The group discussion, in-class presentation and writing of the critiques should all be based on the 6 empirical papers listed in each module.
# Class Schedule

<table>
<thead>
<tr>
<th>week #</th>
<th>week of</th>
<th>Class Time</th>
<th>Class Time</th>
<th>Tutorial Time</th>
<th>Tutorial Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2020-09-07</td>
<td>Course overview</td>
<td>Presentation in Class (40 mins) &amp; Feedback (45 mins)</td>
<td>Q&amp;A</td>
<td>Practice Presentation to Instructor &amp; TAs</td>
</tr>
<tr>
<td>2</td>
<td>2020-09-14</td>
<td>Lecture</td>
<td>Lecture</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2020-09-21</td>
<td>Lecture</td>
<td>Lecture</td>
<td>M2</td>
<td>M1</td>
</tr>
<tr>
<td>4</td>
<td>2020-09-28</td>
<td>Lecture</td>
<td>Lecture</td>
<td>M3</td>
<td>M2</td>
</tr>
<tr>
<td>5</td>
<td>2020-10-05</td>
<td>Lecture</td>
<td>M1</td>
<td>M3</td>
<td>M2</td>
</tr>
<tr>
<td>6</td>
<td>2020-10-12</td>
<td>mid-term recess</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2020-10-19</td>
<td>Lecture</td>
<td>M2</td>
<td></td>
<td>M3</td>
</tr>
<tr>
<td>8</td>
<td>2020-10-26</td>
<td>Lecture</td>
<td>M3</td>
<td></td>
<td>M3</td>
</tr>
<tr>
<td>9</td>
<td>2020-11-02</td>
<td>Midterm</td>
<td>Lecture</td>
<td>M4</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2020-11-09</td>
<td>Lecture</td>
<td>Lecture</td>
<td>M5</td>
<td>M4</td>
</tr>
<tr>
<td>11</td>
<td>2020-11-16</td>
<td>Lecture</td>
<td>M4</td>
<td>M6</td>
<td>M5</td>
</tr>
<tr>
<td>12</td>
<td>2020-11-23</td>
<td>Lecture</td>
<td>M5</td>
<td>M6</td>
<td>M6</td>
</tr>
<tr>
<td>13</td>
<td>2020-12-07</td>
<td>Lecture</td>
<td>Lecture</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Presentation assignment for the 6 modules (M) among the 6 groups (G)

<table>
<thead>
<tr>
<th>Role</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
</tr>
</thead>
<tbody>
<tr>
<td>As primary presenters</td>
<td>G1</td>
<td>G2</td>
<td>G3</td>
<td>G4</td>
<td>G5</td>
<td>G6</td>
</tr>
<tr>
<td>As commentators</td>
<td>G4</td>
<td>G5</td>
<td>G6</td>
<td>G1</td>
<td>G2</td>
<td>G3</td>
</tr>
</tbody>
</table>


**Evaluation**

<table>
<thead>
<tr>
<th></th>
<th>Marked by</th>
<th>Performance</th>
<th>%</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WORK AS A GROUP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group Discussion Notes</td>
<td>TAs</td>
<td></td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Presentation as a primary presenter (practice on Tue the week before)</td>
<td>Instructor/TAs</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Presentation as a commentator (practice on Tue the week before)</td>
<td>Instructor/TAs</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Presentation as a primary presenter (Wed class time)</td>
<td>Instructor/TAs</td>
<td></td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Presentation as a commentator (Wed class time)</td>
<td>Instructor/TAs</td>
<td></td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td><strong>WORK AS AN INDIVIDUAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Written Critiques (Total 2)</td>
<td>TAs</td>
<td></td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>TAs</td>
<td></td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Participation</td>
<td>Peers/ Instructor/TAs</td>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Within group</td>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Instructor/TAs</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In class/group</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Written Exam</td>
<td>Midterm</td>
<td></td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Final</td>
<td></td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TAs</td>
<td></td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

**Required readings for each module**

1. Multiple memory systems I

2. Multiple memory systems II

3. Perceptual learning: visual system

4. Hippocampus: Spatial learning in humans

5. LTP I: behavioural works

6. LTP II: cellular approaches
**Detailed Requirements**

**Group Discussions** (Prior to Wed class time):
- For the groups who are not presenting, each group will complete the discussion of the empirical paper listed for the target module which is scheduled to be formally presented in class one week following this discussion. At the end of the discussion, the group will be required to hand in a written summary of the issues discussed.
- Before this group discussion period, each INDIVIDUAL student is urged to submit to Avenue his/her own discussion note (to earn participation marks) and the group should meet to discuss the paper before this discussion period generate the draft of the discussion note.

**Presentations in Class by Students Groups** (during Wed class time):
- The “primary presentation” group should present the basic findings (15-20 minutes).
- The “commentator” group should make comments on the paper (15-20 minutes) and explore the broader issue(s) related to the empirical papers.
- All group members must participate in the presentations and the answering of questions during/following the presentation.
- At the tutorial time slot the week before the formal presentation; both groups give a practice presentation to earn 1/5 of the grade allocated for the presentation.
- Oral presentations will be graded by class as well as by the instructor/TAs, based on the content delivered, the logical flow of ideas, and the presentation style.
- The presentations should incorporate proper audiovisual aids (e.g., Powerpoint slides) and handouts if necessary. The presentation slides should be submitted to Avenue by 8 pm the day before the presentation (for both practice presentation and formal presentation). Late submission of the ppt to Avenue will lead to reduction of 10% of the grade.
- On the top right corner of each slide of the presentation, identify the name of the presenter(s) for that slide. Each page should also contain page number.
- The slides might be in MS Power point format. If you use google, submit the link
- If there is any revision after the formal presentation, make sure you submit again the final copy of the ppt file within 3 days of the presentation.

**Critiques written by Individual Students** (to be submitted by Wed class time):
- For 2 of the 6 modules (NOT the module they are responsible for presenting), students are expected to write a critique based on the empirical paper listed in that module. Students will be given the opportunity to write three critiques, in which case, the two critiques with the highest marks will be included in the final grade.
- The hard copy of the critique of a module is due at class when that module is being presented. Late critiques will NOT be accepted. The electronic version of the critique (in Word file) should ALSO be submitted to avenue by the time the module is being presented.
- The length of the critique should be no more than 2 pages double spaced with a font size of 12 points.

**Participation Grades**

Participation graded for within group performance by peer group members
- All groups are required to keep a written record of their group meetings.
At the end of the term, each member will be required to hand in a written evaluation of the contributions of each of their group members.

Both, grades (in terms of %) and a written justification should be provided for ALL aspects of participation (e.g. including intellectual contribution and contribution of time and effort, etc).

Typically, all group members will be given the same grade for the discussion note and presentation, however the instructor reserves the right to factor-in peer evaluations, and may adjust the presentation marks for certain individuals accordingly (e.g., those who contribute very little to the joint effort).

Participation graded by instructor/TAs:
Participation grades will be assigned based on the student's performance in the following aspects:
- **Submission of the discussion note by each INDIVIDUAL students**
- **Active learning**
  - Contributions to class discussion (in class or on Avenue)
  - Contributions to group discussions
  - Contributions to literature search (students are encouraged to share suitable articles with the group and class)
  - Showing initiative in organizing group activities
- **Providing extensive and informative feedback to other students on their oral presentation, by completing a very brief evaluation form at the end of each presentation**
- **Providing feedback and suggestions to the teaching of this course (e-mail to the instructor)**

Exams
The written exams will cover lecture and required readings materials. Midterm tests can only be written at the time indicated (there will be no make-up tests or special sessions for any student). Students with valid reasons for missing a midterm test must consult the Dean of Studies office for their faculty (e.g. Science or Social Science). If (and only if) there is adequate written justification for missing the test, such students will have their grades proportionately re-weighted, increasing the relative contribution of the other portion of the grades. The exams will consist of short answer and essay questions.

This course may use proctoring software for tests/exams. This software may require you to turn on your video camera, present identification, monitor and record your computer activities and lockdown your browser during the exam. This software may be required to be installed before the exam begins. If you have questions about whether this software will be used, or concerns about the use of this software, please contact the course instructor.

Final grades will be assigned according to the following conventional scheme:

<table>
<thead>
<tr>
<th>Grade</th>
<th>90-100</th>
<th>85-89</th>
<th>80-84</th>
<th>77-79</th>
<th>73-76</th>
<th>70-72</th>
<th>67-69</th>
<th>63-66</th>
<th>60-62</th>
<th>57-59</th>
<th>53-56</th>
<th>50-52</th>
<th>0-49</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>A</td>
<td>A-</td>
<td>B+</td>
<td>B</td>
<td>B-</td>
<td>C+</td>
<td>C</td>
<td>C-</td>
<td>D+</td>
<td>D</td>
<td>D-</td>
<td>F</td>
<td></td>
</tr>
</tbody>
</table>

The instructor reserves the right to adjust final marks up or down, on an individual basis, in light of special circumstances and/or the individual's overall performance in the course. The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.
McMaster University Statement on Inclusivity and Academic Integrity:

The University values integrity, inclusiveness and teamwork, and strives to support the personal and collective growth of the McMaster student community.

These values are foundational to ensuring campus environments – both in-person and virtual – are conducive to personal wellbeing and academic success.

**Inclusivity and a Culture of Respect**

As a McMaster student, you have the right to experience and the responsibility to demonstrate respectful and dignified interactions within all of our living, learning and working communities. Expectations are described in [Code of Student Rights & Responsibilities](#).

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students’ access to these platforms.

Additional information about the Code and netiquette can be found [here](#).

**Academic Integrity and Honesty**

As a McMaster student, you are expected to exhibit honesty and ethical behaviour in all aspects of the learning process. The academic credentials that you earn are rooted in the principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, (e.g., the grade of zero on an assignment, loss of credit with a notation on the transcript which reads: “Grade of F assigned for academic dishonesty”) and/or suspension of expulsion from the university).

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the [Academic Integrity Policy](#).

Some helpful information can be found [here](#).