Psych 3FA3: Neurobiology of Learning and Memory
(2014-2015, Term 1)

Instructor:
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Michel BELYK, belykm@mcmaster.ca, ext.21443, PC235

Weekly Schedule:
Class: Tuesday, 12:30-13:20 (HH104)
Class: Friday, 12:30-14:20 (HH104)
Tutorial: Wednesday, 11:30-13:20 (HH104)

Office Hour (PC 415):

Virtual Classroom:
http://avenue.mcmaster.ca/

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 6 of the 14 weeks, introductory material will be covered in a traditional lecture format. In the remaining 8 of the 14 weeks, for 1 hour only, introductory lectures will be given by the instructor and there will be another hour of student group discussions, and another hour of class presentations.
## Class Schedule

<table>
<thead>
<tr>
<th>Week of</th>
<th>Tuesday (1 hour)</th>
<th>Friday (2 hours)</th>
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<tbody>
<tr>
<td>1</td>
<td>Sept 1 Course overview &amp; Lecture</td>
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<td>2</td>
<td>Sept 8 Lecture</td>
<td>Lecture</td>
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<td>3</td>
<td>Sept 15 Lecture</td>
<td>Lecture</td>
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<td>4</td>
<td>Sept 22 Lecture</td>
<td>Lecture on presentation and critique writing</td>
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<td>Group discussion of M1</td>
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<td>5</td>
<td>Sept 29 Lecture</td>
<td>Presentation of M1 (Multiple memory systems I)</td>
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<td>Group discussion of M2 &amp;</td>
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<tr>
<td>6</td>
<td>Oct 6 Lecture</td>
<td>Presentation of M2 (Multiple memory systems II)</td>
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<td>Group discussion of M3 &amp;</td>
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<tr>
<td>7</td>
<td>Oct 13 Lecture</td>
<td>Presentation of M3 (Perceptual learning: visual system)</td>
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<td>Group discussion of M4 &amp;</td>
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<tr>
<td>8</td>
<td>Oct 20 Lecture</td>
<td>Presentation of M4 (Hippocampus: Spatial learning in humans I)</td>
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<td></td>
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<td>Group discussion of M5 &amp;</td>
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<td>9</td>
<td>Oct 27 Mid-term exam</td>
<td>Mid-term recesses</td>
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<td>10</td>
<td>Nov 3 Lecture</td>
<td>Presentation of M5 (Hippocampus: Spatial learning in humans II)</td>
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<td>Group discussion of M6 &amp;</td>
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<td>11</td>
<td>Nov 10 Lecture</td>
<td>Presentation of M6 (Hippocampus: place cells)</td>
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<td>Group discussion of M7 &amp;</td>
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<tr>
<td>12</td>
<td>Nov 17 Lecture</td>
<td>Presentation of M7 (LTP I: behavioural approaches)</td>
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<td>Group discussion of M8 &amp;</td>
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<tr>
<td>13</td>
<td>Nov 24 Lecture</td>
<td>Presentation of M8 (LTP II: cellular approaches)</td>
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<td></td>
<td>Lecture</td>
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<td>14</td>
<td>Dec 1 Review</td>
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### Overall Requirements

The course includes three learning formats:
- Reading
- Lecture
- Discussions/Presentations/Critiques
Reading Materials
The textbook by Eichenbaum will provide background information for the lectures. Some other supplementary reading materials will also be recommended.

Reading 2: Psychology 3FA3 courseware (available in Campus Bookstore)
The readings provided in the courseware are 8 empirical papers (required reading).

In addition to the required readings, there are some written commentaries discussing these 8 papers. These supplementary reading materials are provided in another courseware available in Campus Bookstore.

Lectures
Lectures will be delivered for total of three hours in weeks 2 and 3, and for one or two hours in the rest of the 14 weeks.
Lecture topics:
- History
- Multiple memory systems
- Cortex
- Spatial learning
- LTP

Discussion/Presentations/Critiques (weeks 4-8 and 10-13, total 8 weeks)
For these 8 weeks, the two hours on Friday’s classes will be reserved for group discussion (for all groups) and class presentations (by 2 selected groups). Students will work in groups of 3 to 5.

- **Discussions**: During class time (for 0.5-1 hour), each group will discuss the empirical paper listed for the target module which is scheduled to be formally presented in a week. At the end of the discussion, the group will be required to hand in a written summary of the issues discussed.
- **Presentations**: Each group will be assigned 2 of the 8 modules for which they will be responsible for giving a formal presentation of the empirical papers to the class. The other six groups will attend the presentation and participate in the discussions. For each module, the presentation in class is done 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 Module 1-4, the other among Module 5-8) of the 8 modules (but not the ones they are presenting in class). The content of the critiques should be discussed during group discussions mentioned above; 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 empirical papers listed in each module.
Presentation assignment (Fridays) for the 8 modules (M) among the 8 groups (G)

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<thead>
<tr>
<th>Role</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
<th>M7</th>
<th>M8</th>
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<tr>
<td>As primary presenters</td>
<td>G1</td>
<td>G2</td>
<td>G3</td>
<td>G4</td>
<td>G5</td>
<td>G6</td>
<td>G7</td>
<td>G8</td>
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<tr>
<td>As commentators</td>
<td>G5</td>
<td>G6</td>
<td>G7</td>
<td>G8</td>
<td>G1</td>
<td>G2</td>
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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 I


5. Hippocampus: Spatial learning in humans II


6. Hippocampus: place cells


7. LTP I: behavioural works


8. LTP II: cellular approaches

Evaluation

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<tr>
<th>Marked by</th>
<th>Performance</th>
<th>%</th>
<th>Total %</th>
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<tbody>
<tr>
<td><strong>WORK AS A GROUP</strong></td>
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<tr>
<td>Group Discussion Notes</td>
<td>TAs</td>
<td>8</td>
<td>8</td>
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<tr>
<td>Presentation as primary presenter</td>
<td>Instructor/Peers</td>
<td>7.5</td>
<td>15</td>
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<tr>
<td>Presentation as commentator</td>
<td>Instructor/Peers</td>
<td>7.5</td>
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<tr>
<td><strong>WORK AS AN INDIVIDUAL</strong></td>
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<tr>
<td>Written Critiques (Total 2)</td>
<td>TAs</td>
<td>10</td>
<td>20</td>
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<tr>
<td>Participation</td>
<td>Peers</td>
<td>Within group</td>
<td>4</td>
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<tr>
<td>Written Exam</td>
<td>Midterm</td>
<td>TAs</td>
<td>15</td>
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<td>Final</td>
<td>TAs</td>
<td>30</td>
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**DETAILED REQUIREMENTS**

**Discussions:**
- Each group will discuss the empirical paper listed for the target module which is scheduled to be formally presented in class one week after the discussion.
- At the end of the one-hour discussion, the group will be required to hand in a written summary of the issues discussed.
- The summary sheet will be graded and only students who attend the discussion will be given the grade.

**Presentations**
- The primary presenting group should present the basic findings (15 minutes).
- The “commentator” group should make comments on the paper (15 minutes) and explore the broader issue(s) related to the empirical papers. For the issues to be addressed, this group may follow the guidelines for writing the 2nd part of a critique.
- All group members must participate in the presentations and the answering of questions during/following the presentation.
- On the top right corner of each slide of the presentation, identify the name of the presenter(s) for that slide.
- Oral presentations will be graded by class as well as by the instructor, 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 sent to the instructor electronically by 8 pm, the day before the presentation. If there is any revision after that, make sure you send the instructor the final copy of the ppt file.

**Critiques**
- For 2 of the 8 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 should also be submitted by the time the module is being presented.
- See separate sheet for detailed instructions for the suggested content of the critique.

**Participation Grades**

Participation graded for within group performance by peer group members

- 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:

- Attendance in class and at group meetings and punctuality
- Active learning
  - Contributions to class and group discussions
  - 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 (closed book) will cover lecture and required readings materials. Midterm tests can only be written at the times 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.
Final grades will be assigned according to the following conventional scheme:

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<tr>
<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>
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<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>
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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.

Attention is drawn to the Statement on Academic Ethics and the Senate Resolutions on Academic Dishonesty as found in the Senate Policy Statements distributed at registration and available in the Senate Office. Any student who infringes one of these resolutions will be treated according to the published policy.