Course Description:
We will explore the organization, emergent function and psychopathology of three fundamental neural networks: the corticolimbic, corticostriatal and corticohippocampal circuits. Over the course of the semester we will study these circuits from a neuroscientific perspective, relating functional anatomy to physiology and behavior. In addition, we will examine the role these circuits play in psychiatric disorders. Textbook readings will be supplemented by recent primary research and review articles describing current findings from the neuroscientific literature.

Learning Outcomes:
1) Identify and describe the key components and functions of the corticolimbic, corticostriatal and corticohippocampal circuits

2) Describe, in writing, fundamental concepts that apply to advanced topics in neuropsychology

3) Evaluate, orally, current theories and relevant scientific research on advanced topics in neuroscience.

Class Web Site: Class documents, assignments, grades, and resources will be available on our Blackboard site, which also includes communication tools for the class. Check Blackboard regularly for updates and announcements.

Reading Assignments: The following textbook is required for the course.


We will also read and present a number of scientific research articles over the course of the semester. Content from those articles may appear on exams and quizzes. Please see “group presentations” below. PDFs of articles will be posted on Blackboard.
**Top Hat:** See the Class Format section for description. Top Hat is a cloud based interactive lecture tool which I will use to take attendance, gather your feedback and pose questions each class period. Each question will be weighted 50% for accuracy and 50% for participation. Classroom questions can be completed only during lecture and there will be no make-ups for missed classes. Throughout the class, I will have a Top Hat Discussion open for any questions that arise.

**Class Format:** This course will consist of in-class lectures and discussions covering topics and concepts. Throughout the semester we will incorporate active learning sessions to discuss topics at hand or work on questions posed to the class. To make lectures more engaging and to encourage participation and attendance, interactive questions will be posted to Top Hat which you will answer on your smart phone, laptop or tablet device during each class. You will receive an invitation to join our class Top Hat ($24 per semester or $72 for 5 year subscription).

My lecture slides will be posted on Blackboard before class to help with note taking.

**CO-OP:** If, at any time, we are covering a topic that is relevant or related to your co-op experience (or one you are planning to do), please share your experience and/or insight with the class.

**Grading:**

Exams: 3 @ 60 % of final grade  
Quizzes: 3 @ 20 % of final grade  
Presentations @ 15% of final grade  
Attendance & Participation: 5% of final grade (if you have > 90% attendance you get 100%).

Exam and quiz format may consist of: Multiple choice (scantron), Fill-in the blank, Matching, Problem Solving, True/False and short answer questions. Exams will account for 60% of your final grade.

Quizzes are designed to encourage you to regularly review your notes as well as assess the effectiveness of my lectures. Quizzes will be given at the beginning of class and should take no more than 30 minutes to complete. No make up quizzes will be given. We will have 3 quizzes over the course of the semester. Quizzes will account for 20% of your final grade.

Group Presentation: As a group, you will read and present selected research/review articles related to the topic *du jour*. Groups will then lead a discussion relating the article to topics/concepts covered in class. Presentations should provide: 1) relevant background information; 2) a brief overview of the methodology; 3) results and conclusions; 4) an evaluation of how the research was conducted and its significance. The results and significance of the experiments described in the article should be the major focus of presentations. When applicable, each group member should present a figure from the article, briefly introducing it and relating it to the context of the article. I will provide a handout with more detailed information along with a rubric I will use to assess presentations.
Grades will be on the ABCDF scale with +/- modifiers. It is anticipated that letter grades for this course will be assigned to the scale below.

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<tr>
<th>Grade</th>
<th>Range</th>
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<td>B+</td>
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Course Policies:

This course follows the College of Science Academic Course Policies, which are viewable at this link:


Exam Policy: Students will only be allowed to use the following materials during an exam: writing utensils, plain white scrap paper, and a basic calculator (if necessary). Students will not be allowed to use text books, notes, cell phones, e-readers, tablets or laptops during the exam period. Students caught with any of these materials will receive automatic zero for the exam. Students will have the allotted class time to complete exams. Exams will primarily cover material from the current period, though knowledge of fundamental concepts covered earlier in the semester will be assumed. Make up exams can be scheduled should you have an unavoidable health or personal emergency. Only one make up exam per student per semester will be offered. Please contact me as soon as possible if you have a conflict with an exam so we can make the appropriate accommodations for you.

Cell Phone Policy: If there is a problem or emergency please excuse yourself and step outside of the classroom to take or make a phone call. Students who are disruptive during the class period will be warned, and receive a 2% deduction from your final grade for each time the instructor needs to address you after the first warning.

Getting Help: Come to my office hours; make an appointment to see me at another time; email me with questions.
Peer tutoring:
Students requiring additional help are advised to come to my office hours (see above) with questions. Peer tutoring is also available through the Peer Tutoring Program via this link:

http://www.northeastern.edu/undergraduate/mentoring-advising/

Statement on Academic Integrity:
I adhere to Northeastern’s Policy on academic integrity:

http://www.northeastern.edu/osccr/academic-integrity-policy/
Academic dishonesty is a serious offense and renders the offender liable to disciplinary action. Students caught violating the policy will be penalized according to the severity of the offense. Possible penalties range from grade reduction to failure of the course.

Students with Disabilities:
Accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Resources Center (DRC), 20 Dodge Hall (x2675).

TOPICAL OUTLINE BIOLOGICAL PSYCHOLOGY – PSYC 4512 CRN 36478

In the event that class is canceled, all due dates (e.g., exams, quizzes) will be shifted to the next class.

Unit I: The Corticolimbic Circuit for Recognition and Reaction

1) 1/11
Chapter 1: Introduction to Neuropsychology

2) 1/13
Chapter 1 Continued
How we study the brain
fMRI and the BOLD Signal

3) 1/14
Chapter 2. Organization of the Corticolimbic Circuit

1/18 (MLK Day, No Class)

4) 1/20
Chapter 2 Organization of the Corticolimbic Circuit Continued
Role of hypothalamus, brain stem, substantia innominata, insula, hippocampus and prefrontal cortex
5) 1/21
Chapter 2 Organization of the Corticolimbic Circuit Continued
Ghashghaei et al., 2007 Sequence of information processing for emotions based on the anatomic dialogue between prefrontal cortex and amygdala.

6) 1/25
Chapter 2 Organization of the Corticolimbic Circuit Continued

7) 1/27
Chapter 2 Organization of the Corticolimbic Circuit Continued
Do-Monte et al., 2015 A temporal shift in the circuits mediating retrieval of fear memory

Quiz #1

8) 1/28
Chapter 3: Order of the Corticolimbic Circuit
Fear learning, extinction and recall

9) 2/1
Chapter 3: Corticolimbic Order Continued
Group Presentation of Quinones-Laracuente et al., 2015 The effect of repeated exposure to ethanol on pre-existing fear memories in rats

10) 2/3
Chapter 3: Corticolimbic Order Continued
Facial expressions and fear
Group Presentation of Hadj-Bouziane et al., 2012 Amygdala lesions disrupt modulation of functional MRI activity evoked by facial expression in the monkey inferior temporal cortex

11) 2/4
Chapter 4: Corticolimbic Circuit Disorder
Disorders associated with amygdala hyperactivity

12) 2/8
Chapter 4: Corticolimbic Circuit Disorder Continued
Post Traumatic Stress Disorder
Group Presentation of Killgore et al., 2014 Cortico-limbic responses to masked affective faces across PTSD, panic disorder and specific phobia

13) 2/10 Chapter 4: Corticolimbic Circuit Disorder Continued
Autism
Group Presentation of Zikopoulos & Barbas 2013 Altered neural connectivity in excitatory and inhibitory cortical circuits in autism
Chapter 4: Corticolimbic Circuit Disorder Continued
Psychopathy, depression and williams syndrome

2/15 (Presidents’ Day, No Class)

EXAM #1

Unit II: Corticostriatal Circuit for Motivation and Action

16) 2/18
Chapter 5: Organization of the Corticostriatal Circuit

17) 2/22
Chapter 5: Organization of the Corticostriatal Circuit Continued
Dopaminergic pathway

18) 2/24
Chapter 6: Corticostriatal Circuit Order
Reward Learning

19) 2/25
Chapter 6: Corticostriatal Circuit Order Continued
Group Presentation of Mingote et al., 2008 Nucleus accumbens adenosine A2A receptors regulate exertion of effort by acting on the ventral striatopallidal pathway

20) 2/29
Chapter 6: Corticostriatal Circuit Order Continued
Group Presentation of Haber and Behrens, 2014 The neural network underlying incentive-based learning: implications for interpreting circuit disruptions in psychiatric disorders

21) 3/2
Chapter 6: Corticostriatal Circuit Order Continued
Quiz #2
Costs vs. Rewards
Trust and Schadenfreude

22) 3/3
Chapter 6: Corticostriatal Circuit Order Continued
Group Presentation of Farrar et al., 2008 Forebrain circuitry involved in effort-related choice: injections of the GABA A agonist muscimol into ventral pallidum alter response allocation in food-seeking behavior

3/7 Spring Break, No Class
3/9 Spring Break, No Class
3/10 Spring Break, No Class
Chapter 7: Corticostriatal Circuit Disorder
Disorders associated with ventral striatum hypoactivity
Disorders associated with ventral striatum hyperactivity

Chapter 7: Corticostriatal Circuit Disorder Continued
Group Presentation of Choi et al., 2015 Mapping the “depression switch” during intraoperative testing of subcallosal cingulate deep brain stimulation.

EXAM #2

Unit III: Corticohippocampal Circuit for Memory and Executive Control

Chapter 8: Organization of the Corticohippocampal Circuit
Prefrontal Cortex
Cortical Type

Chapter 8: Organization of the Corticohippocampal Circuit
Organization of the hippocampal formation
Medial temporal lobe memory system

Chapter 8: Organization of the Corticohippocampal Circuit
Pathways to and from the hippocampus
Hierarchy of associativity

Chapter 8: Organization of the Corticohippocampal Circuit
Group Presentation of Anderson et al., 2015 Prefrontal-hippocampal pathways underlying inhibitory control over memory

Chapter 9: Corticohippocampal Circuit Order
Henry Molaison
Quiz #3

Chapter 9: Corticohippocampal Circuit Order Continued
Memory
Long term potentiation
32) 4/4
Chapter 9: Corticohippocampal Circuit Order Continued
Prefrontal cortex and executive control
Working memory
Response selection

33) 4/6
Chapter 10: Corticohippocampal Disorder
Amnesic syndromes
Clive Wearing
Insausti et al., 2014

34) 4/7
Chapter 10: Corticohippocampal Disorder Continued
Alzheimer’s Disease
Mild cognitive impairment

35) 4/11
Chapter 10: Corticohippocampal Disorder Continued
Alzheimer’s continued

36) 4/13
Chapter 10: Corticohippocampal Disorder Continued
Prefrontal executive control dysfunction
Anxiety disorder
Bipolar disorder
Obsessive compulsive disorder

37) 4/14
Chapter 10: Corticohippocampal Disorder Continued
Executive control dysfunction and schizophrenia

4/18 Patriots Day-No Class

38) 4/20
Catch up and exam review.

EXAM 3 – (Held during finals week. Date, time and location TBA)

This syllabus is subject to change with notification.