PSYCH 109S: Introduction to Cognitive Neuroscience

When: Mondays and Wednesdays, from 10:00-11:50 A.M.
Where: School of Education 210

Materials:
There is no required textbook. All required materials will be available on Coursework (coursework.stanford.edu). Students looking for a reference may want to purchase Gazzaniga, M. S., R. B. Ivry, et al. (2009). Cognitive neuroscience : the biology of the mind. New York, W.W. Norton. This book is very accessible, covers a wide range of topics and overlaps considerably with the content of the course.

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Office hours will be held by appointment. Please send an email or come talk to us after class to discuss any questions or schedule a time to meet. If you are going to email to ask a general question, please include all four instructors on your email.

Objective:
This course is intended as an overview of cognitive neuroscience and is organized in two parts. On the first, we will deal with foundational issues. What are the main questions addressed by cognitive neuroscience? How might final answers to these questions build on our understanding of the brain at the cellular and anatomical levels? What kinds of tools does the field have at its disposal? The second part of the course will review recent findings and discuss current research strategies in four major areas of investigation: memory, vision, decision-making and emotion. The focus on these specific topics will provide students with an opportunity to consider the relationship between the explanatory detail achieved by representative subfields of the discipline and the compromise between high-level questions and low-level experimental control.
Grading and assignments:

Participation:  5%
Field trip to CNI (7/15/13):  5%
Article review paper and presentation:  20%
Midterm exam (7/17/13):  30%
Final exam (TBD):  40%

Participation:
We expect students to do all of the readings prior to discussion and come to class everyday. The course is relatively small and allows for direct student-instructor interactions on a daily basis. Please feel free to ask questions. We will evaluate understanding of the material in every class.

Field Trip to the Center for Neurobiological Imaging:
We have organized a visit to the MRI scanning facility in the basement of Jordan Hall. The purpose of this trip is for students to become familiar with brain anatomy and imaging technology. We will divide the class into two groups and everyone will have a chance to observe post-mortem brains and a live scanning session. We will analyze the resulting images and present them on the following class. Attendance is required.

Article Review and Paper Presentation:
Starting on July 8th, 3-4 students will prepare a written review of the readings assigned for the previous lecture and present it in class.

The written review should be prepared individually and will be evaluated on that basis. This report should be prepared as a 3-4 page, double-spaced document. The written review must be in your own words; if you have any questions about whether or not something is ‘in your own words’, ask us before you submit your paper. The presentation portion should be coordinated among the group and last approximately 15 minutes. All students in a group should present. To help you with the content of this assignment we will make questions available for each topic. These questions will be posted on Coursework along with the corresponding readings. At a minimum, your written review and presentation should provide answers to the questions provided. If space and/or time allows, we encourage you to also include your own thoughts on how the papers relate to each other, how the papers relate to other course material, or how the ideas in the papers could be expanded or tested with additional experiments.

All students should read the papers before the presentation and be prepared to contribute to the discussion. Please also keep in mind that the content from the assigned
papers will be included on the exams. The questions we provide should give you clues as to which content we think is most important.

Please also note that the assigned papers are advanced and technically challenging, which is why we suggest you read each paper twice in order to fully comprehend relevant information. Before coming to lecture, please skim the assigned material. After lecture, go back and thoroughly analyze each paper so you are prepared to discuss the material in the beginning of the next class. For example: prior to attending class 4, please briefly review the readings (the Cohen, Miller, and Aguirre papers). After lecture, thoroughly re-read each paper so you are prepared to ask questions and follow the discussion of the 3 papers in the next class on 7/8. If you find yourself struggling with the papers, we can help you, but not if you wait until the last minute!

You are encouraged to select a topic of interest early on by signing up on a Google Doc that will be emailed to the course list after the first class. A maximum of three students can sign up for each topic. These slots are distributed in a “first come first serve” basis. The instructors will select the rest of the students in each group. There is a column to indicate your preference for a specific topic in the sign-up sheet. We will do our best to assign students to their topic of interest. However, we cannot guarantee that everyone will get his or her preferred topic. You may sign-up for only one topic or indicate one preference on the 4th column of the linked spreadsheet.

The presentation and/or review must be completed and turned in on schedule, or a note from a doctor or dean (or equivalent) must be provided. Without a note, a student will receive a zero. Even with a note, the presentation portion cannot be rescheduled; in these instances, the grade will be based entirely on the written portion of the assignment.

Exams:
Both exams will be cumulative. Any and all material presented in the readings or in the lectures prior to the exam date can be included. In general, the lectures and readings will have little or no overlap. Students are encouraged to take notes during lecture, but computers are not allowed in class or during the exam sessions.

Any accommodations for rescheduling an exam must be requested at least two weeks before the exam date. Any requests for rescheduling after this date require a note from a doctor or a dean (or equivalent).
Topics/readings schedule:

**Week 1**

6/24 (Class 1): Class logistics and problems in cognitive neuroscience

No reading required.

6/26 (Class 2): Basic neurobiology


**Week 2**

7/1 (Class 3): Overview of major topics

No reading required.

7/3 (Class 4): Cognitive neuroscience methods


*Note: Only the section titled ‘Basic types of neuroimaging inference’ is required.*

**Week 3**

7/8 (Class 5): Declarative memory and the medial temporal lobe memory system


Not required, but related, interesting, and posted online:


7/10 (Class 6): Working memory and non-declarative memory


Week 4

7/15 (Class 7): Fieldtrip to CNI


7/17 (Class 8): Midterm exam

No readings required.

Week 5

7/22 (Class 9): Early visual pathway


7/24 (Class 10): Object and face recognition


**Week 6**

7/29 (Class 11): Sensory integration and perceptual decision-making


7/31 (Class 12): Reward processing and reinforcement learning


**Week 7**

8/5 (Class 13): Value-based decision-making


8/7 (Class 14): Emotions and decision-making


**Week 8**

**8/12 (Class 15): Emotions**


Included peer commentaries:

C1: Hamann, S. What can neuroimaging meta-analyses really tell us about the nature of emotions?


C3: Waugh, C. E., & Schirillo. Timing: A missing key ingredient in typical fMRI studies of emotion

**8/14 (Class 16): Emotions and memory**


**Week 9**

**TBD: Final exam**