

Lab in Cognitive Neuroscience
PSYC/NEUR 2775
Spring 2019
Lecture T/TH 10:05-11:30
Sills 109
Laboratory W or TH 1:15-4:10
Kanbar 001

Instructor's name: Erika Nyhus
E-mail address: enyhus@bowdoin.edu
Office: Kanbar 220
Office Hours: W 9-10, W/TH, 4:10-5; or by appointment
Instructor's website: <http://www.bowdoin.edu/faculty/enyhus/>
Course website: <https://blackboard.bowdoin.edu/>

Lab instructor's name: Anja Forche
E-mail address: aforche@bowdoin.edu
Office: Kanbar 007
Office Hours: F, 9-10; or by appointment

Course Description and Learning Goals

Cognitive neuroscience is the scientific study of how people think. Cognitive neuroscientists seek to understand the neurocognitive processes that underlie human abilities in domains such as perception, attention, memory, emotion, language, executive function, and decision-making.

The goal of this class is to expose you to multiple techniques in cognitive neuroscience that can be applied to the study of human cognition. The lectures will focus on discussion of neuroimaging techniques and their application to the study of various aspects of human cognition. In the lab you will gain hands-on experience performing cognitive neuroscience experiments using EEG and fMRI analysis. This course meets the Mathematical, Computational, or Statistical Reasoning (MCSR) and Inquiry in the Natural Sciences (INS) distribution requirements by allowing you to question, measure, model, and explain brain processes and to apply statistics to behavioral and neuroimaging data.

Course Materials

The course will be interactive with lectures, discussion, and a laboratory.

The reading will come from primary research articles. Readings will be made available on the course website (<https://blackboard.bowdoin.edu/>).

Blackboard. The class Blackboard website will be used to post class lecture notes, lab assignments, helpful additional notes, and any other relevant materials. You should also check this site frequently, though I will always announce important additions to Blackboard in class. There will be a Questions section on Blackboard to ask and answer questions raised during the course. Please post questions there first before emailing me. Responses will count toward your class participation grade. Eventually, your grades will also be posted here.

Email. I will use email to communicate with the class, and email is the best way to contact me. I

recommend that you check your email frequently. I will use the class roster email list that is automatically generated by through Blackboard, so be sure to check your official email address. Failure to check email is not a legitimate excuse for missing assignments etc. I will not answer content questions via email. If you have a question, please raise it during class, on the Blackboard Questions section, or come see me during my office hours.

Course Requirements and Grading

There will be four basic course requirements:

(1) Reading reactions: 10% of grade

You will be required to post two discussion questions about each paper presented by your classmates to the Reading Reactions section of Blackboard. You have until noon the day before each presentation to post your questions. However, you cannot post something that has already been posted. You will be graded on the questions you post.

(2) Presentation: 15% of grade

Each week students will lead the discussion of the assigned papers. The student should be prepared to not only summarize the paper, including what was done and what the conclusions were, but also to raise points of discussion to bring in other students in the class.

(2) Class participation: 10% of grade

All students are required to read the papers each week, even if they are not presenting, and contribute actively to the class discussion. Your preparation, participation, and cooperation as a group is essential for this format to work. Note that participation involves both your willingness to generate comments/questions *and* your ability to listen to what others have to say. Class participation credit will also be given for responses to questions raised on the Blackboard Questions section.

(3) Final Examination: 15% of grade

The final examination will take place on **Monday, May 13, from 8:30 a.m. - 11:30 a.m.** The content is comprehensive and covers all the topics and materials covered during the semester (including materials from both lectures and primary research articles). The format will be short written answers.

(4) Lab Grade: 50% of grade

The lab grade will be based on completion of weekly exercises and assignments (20%), two lab papers (30%, 5-10 pages double spaced), a group project proposal (10 pages double spaced) and presentation (20%), and final group project paper (30%, 10 pages double spaced). No late assignments will be accepted unless given prior consent.

Grading Scheme

The following formula will be used to compute your total class score:

Total Score = Reading reactions x 10%

+ Presentation x 15%

+ Class Participation x 10% ^{[[L]]}_{ISEP}

+ Final Exam Score x 15%

+ Lab Grade x 50% ^{[[L]]}_{ISEP}

Final grades will be assigned according to the following standard scale:

<u>Grade</u>	<u>Total Score</u>
A	93.0+
A-	90.0-92.9
B+	87.0-89.9
B	83.0-86.9
B-	80.0-82.9
C+	77.0-79.9
C	73.0-76.9
C-	70.0-72.9
D+	67.0-69.9
D	63.0-66.9
D-	60.0-62.9
F	59.9 or below

Miscellaneous Information

Policies for Late Assignments. No late assignments will be accepted unless given prior consent. If you absolutely have to turn in an assignment late because you are on a Bowdoin sports team (or other Bowdoin-sponsored activity) or have conflicting religious obligations, inform us by the end of January. If you notify the instructors in advance and an appropriate document is turned in, it is possible for us to make appropriate accommodations.

Campus policy regarding religious observances requires that faculty make every effort to reasonably and fairly deal with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. See full details at <https://www.bowdoin.edu/academic-affairs/teaching-advising/religious-holiday-policy.html>.

Honor Code. You are responsible for reading, understanding and following the Bowdoin Academic Honor Code as printed in your Student Handbook (<https://www.bowdoin.edu/academic-handbook/overview/index.html>). You may work on laboratory assignments with whomever you wish (and I encourage this), but you must turn in original work for your grade.

Lecture Schedule

Date **Topic**

- 22 January Introduction
- 24 January Neuroanatomy
Purves et. al.: Appendix
- 29 January EEG physiology and recording
Luck, S.J. (2012). Event-Related Potentials. In D. L. Long (Ed.), *APA Handbook of Research Methods in Psychology*. Washington D.C.: American Psychological Association.
- 31 January ERP Analysis
- 5 February Set up EEG lab
Bentin, S., Allison, T., Puce, A., Perez, E., & McCarthy, G. (1996). Electrophysiological Studies of Face Perception in Humans. *Journal of Cognitive Neuroscience*, 8(6), 551-565.
- 7 February Review EEG/discuss group project
- 12 February Perception – Anne, Sam R
Tanaka, J. W., & Curran, T. (2001). A neural basis for expert object recognition. *Psychological Science*, 12(1), 43-47.
- 14 February Perception – Thanh, Donald
Rossion, B., Collins, D., Goffaux, V., & Curran, T. (2007). Long-term expertise with artificial objects increases visual competition with early face categorization processes. *Journal of Cognitive Neuroscience*, 19(3), 543-555.
- 19 February Physics of fMRI – Guest lecture by Professor Topp
Wittmann, D.C., & D'Esposito, M. (2012). Functional Magnetic Resonance Imaging. In D. L. Long (Ed.), *APA Handbook of Research Methods in Psychology*. Washington D.C.: American Psychological Association.
Huettel, Song, & McCarthy: Chapter 2
- 21 February fMRI Analysis
- 26 February Set up fMRI lab
Henson, R., Shallice, T., & Dolan, R. (2000). Neuroimaging evidence for dissociable forms of repetition priming. *Science*, 287(5456), 1269-1272.
- 28 February March Review fMRI/discuss group project
- 5 March Memory – Audrey, Anu
Wagner, A. D., Schacter, D. L., Rotte, M., Koutstaal, W., Maril, A., Dale, A. M., . . . Buckner, R. L. (1998). Building memories: remembering and forgetting of verbal experiences as predicted by brain activity. *Science*, 281(5380), 1188-1191.
- 7 March Memory – Raquel, Andrew, Adonis
Kahn, I., Davachi, L., & Wagner, A. D. (2004). Functional-neuroanatomic correlates of

recollection: implications for models of recognition memory. *Journal of Neuroscience*, 24(17), 4172-4180.

9-24 March SPRING BREAK

26 March No class--Cognitive Neuroscience Conference

28 March Experiment proposal presentations

2 April Experiment proposal presentations

4 April Other imaging techniques

Gratton, G., & Fabiani, M. (2012). Beyond ERP and fMRI: Other imaging techniques for studying human brain function. In D. L. Long (Ed.), *APA Handbook of Research Methods in Psychology*. Washington D.C.: American Psychological Association.

9 April Emotion – Niki, Six

Herrmann, M. J., Ehlis, A. C., & Fallgatter, A. J. (2003). Prefrontal activation through task requirements of emotional induction measured with NIRS. *Biological Psychology*, 64(3), 255-263.

11 April Emotion – Louis, Kay

Zwanzger, P., Steinberg, C., Rehbein, M. A., Brockelmann, A. K., Dobel, C., Zavorotnyy, M., . . . Junghofer, M. (2014). Inhibitory repetitive transcranial magnetic stimulation (rTMS) of the dorsolateral prefrontal cortex modulates early affective processing. *Neuroimage*, 101, 193-203.

16 April Combined neuroimaging

Ruff, C. C. (2012). Combined neuroimaging methods. In D. L. Long (Ed.), *APA Handbook of Research Methods in Psychology*. Washington D.C.: American Psychological Association.

18 April Combined neuroimaging

23 April Executive Function – Tilly, Jack

Debener, S., Ullsperger, M., Siegel, M., Fiehler, K., von Cramon, D. Y., & Engel, A. K. (2005). Trial-by-trial coupling of concurrent electroencephalogram and functional magnetic resonance imaging identifies the dynamics of performance monitoring. *Journal of Neuroscience*, 25(50), 11730-11737.

25 April Executive Function – Sam L, Katie I

Sauseng, P., Klimesch, W., Heise, K. F., Gruber, W. R., Holz, E., Karim, A. A., . . . Hummel, F. C. (2009). Brain oscillatory substrates of visual short-term memory capacity. *Curr Biol*, 19(21), 1846-1852.

30 April Lesion

Fellows, L.K. (2012). Group studies in experimental neuropsychology. In D. L. Long (Ed.), *APA Handbook of Research Methods in Psychology*. Washington D.C.: American Psychological Association.

2 May Decision Making – Rhianna, Claudia
 Bechara, A., Damasio, H., Tranel, D., & Anderson, S. W. (1998). Dissociation Of working memory from decision making within the human prefrontal cortex. *Journal of Neuroscience*, 18(1), 428-437.

7 May Decision Making – Katie L, Max
 Koenigs, M., Young, L., Adolphs, R., Tranel, D., Cushman, F., Hauser, M., & Damasio, A. (2007). Damage to the prefrontal cortex increases utilitarian moral judgements. *Nature*, 446(7138), 908-911.

13 May Final (Monday) 8:30 a.m. - 11:30 a.m.

Lab Schedule

Date	Lab	Assignment
23&24 January	Introduction/CITI training	CITI certificate
30&31 January	EEG Introduction	
6&7 February	EEG Analysis	Turn in EEG introduction lab
13&14 February	Classmate review of EEG Paper	
20&21 February	fMRI Introduction	Turn in EEG paper
27&28 February	fMRI Analysis	Turn in fMRI introduction lab
6&7 March	Classmate review of fMRI Paper	
13&14 March	SPRING BREAK	
20&21 March	SPRING BREAK	
27&28 March	EPrime tutorial	Turn in fMRI paper Work on group project design
3&4 April	Group project design	Work on group project design
10&11 April	Group project design	Work on group project design
17&18 April	Group project testing	
24&25 April	Group project testing	
1&2 May	Group project analysis	Work on analysis of group project
8&9 May (OPTIONAL)	Group project analysis	Work on analysis of group project

13 May Final Paper due by 8:30am

Caveat. Any information on this syllabus is subject to change at any time. Although I will try to minimize changes as much as possible, I may need to make some necessary adjustments on

the readings, assignments, grading policies, office hours, etc., during the semester. Any changes will be announced in class and/or emailed.