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/  

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% $\frac{1}{3}$

+ Final Exam Score x 15%

+ Lab Grade x 50% $\frac{1}{2}$

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

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

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**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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</table>
22 January  Introduction

24 January  Neuroanatomy
Purves et. al.: Appendix

29 January  EEG physiology and recording

31 January  ERP Analysis

5 February  Set up EEG lab

7 February  Review EEG/discuss group project

12 February  Perception – Anne, Sam R

14 February  Perception – Thanh, Donald

19 February  Physics of fMRI – Guest lecture by Professor Topp
Huettel, Song, & McCarthy: Chapter 2

21 February  fMRI Analysis

26 February  Set up fMRI lab

28 February  March  Review fMRI/discuss group project

5 March  Memory – Audrey, Anu

7 March  Memory – Raquel, Andrew, Adonis
Kahn, I., Davachi, L., & Wagner, A. D. (2004). Functional-neuroanatomic correlates of

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

9 April  Emotion – Niki, Six

11 April  Emotion – Louis, Kay

16 April  Combined neuroimaging

18 April  Combined neuroimaging

23 April  Executive Function – Tilly, Jack

25 April  Executive Function – Sam L, Katie I

30 April  Lesion

2 May Decision Making – Rhianna, Claudia

7 May Decision Making – Katie L, Max

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

### Lab Schedule

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

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.