UNDERGRADUATE PROGRAM IN NEUROSCIENCE

STEP 1: THE CURRICULAR CONTEXT
A. DEGREES AND MINORS OFFERED BY YOUR PROGRAM, INDIVIDUALLY OR JOINTLY.

1. Bachelor of Arts in Neuroscience

B. UNDERGRADUATE MAJORS OFFERED BY OTHER DEPARTMENTS AND PROGRAMS THAT DEPEND ON COURSEWORK IN YOUR PROGRAM.

For Biology: NE 203 satisfies a lab requirement; PS/NE 333, 337, 338, 528, 530, 554, NE/BI 525 and NE/BI 535 count as elective credit;

College of Engineering: PS 222 and PS/NE 234 satisfy a social science requirement;

Sargent College: NE 101 satisfies a neuroscience requirement for Health Science majors; PS/NE 234 is required for its various majors; NE 360/SAR HS 361 counts as an elective for Health Science majors;

C. N/A

D. COLLEGE REQUIREMENTS AND PROGRAMS: WRITING, FOREIGN LANGUAGE, MATH, GENERAL EDUCATION (CORE CURRICULUM AND DIVISIONAL STUDIES, INCLUDING HONORS).

1. Core Curriculum. Dr. Lipton is co-developing CC 212, and will be co-teaching the course – on a yearly basis - beginning Spring 2016. He also will be a new Associate Director for the Core Curriculum.

2. N/A

3. N/A

4. N/A

5. Divisional Studies courses that also serve as gateways to your major(s).

Our first semester freshman course, CAS NE 101 (Introduction to Neuroscience), serves as a Natural Science Divisional course for non-majors in CAS, SAR, SHA, SMG, COM.

6. N/A

7. N/A

8. Integrated Science Experience. Drs. Lipton and Pastorino have been working with the Departments of Chemistry and Biology to design two new integrated lab courses for neuroscience and biology majors. The Integrated Science Experience I (I.S.E. I) will offer first year students a single, combined lab course (CH/BI/NE 116) in place of CH 102, NE 102, BI 108 beginning Spring 2016. I.S.E. II will offer sophomores a single, combined lab course (CH/BI/NE 218) in place of CH 203 and NE 203, and as an addition to BI 203, beginning in Fall 2016.

STEP II. ASSESSMENT OF SPECIFIC COURSE NEEDS
Each of our introductory core courses are required for all neuroscience majors, and meet or exceed their enrollment cap each year. To meet the programmatic needs of neuroscience majors, each course must be offered annually.
<table>
<thead>
<tr>
<th>Course</th>
<th>Semester offered</th>
<th>Enrollment Cap</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>NE 101</td>
<td>Fall</td>
<td>150 (actual 176)</td>
<td>Lipton (Neuroscience)</td>
</tr>
<tr>
<td>NE 102*</td>
<td>Spring</td>
<td>108</td>
<td>Pastorino (Neuroscience)</td>
</tr>
<tr>
<td>NE 202</td>
<td>Spring</td>
<td>130</td>
<td>Somers (Neuroscience/PBS)</td>
</tr>
<tr>
<td>NE 203*</td>
<td>Fall</td>
<td>96</td>
<td>Gavornik &amp; Cruz-Martin (Neuroscience/Bio)</td>
</tr>
<tr>
<td>NE 204*</td>
<td>Spring</td>
<td>112</td>
<td>Kramer</td>
</tr>
</tbody>
</table>

The following list of courses satisfy elective credit in the neuroscience major. Enrollment in many of these courses consistently meets or exceeds enrollment limits. Given that most courses on this list serve the needs of two very large undergraduate CAS majors, none should be offered any less than annually.

(Relative demand: ** high; ***at or exceeds enrollment cap)

**Biology**

**BI 203 Cell Biology (fall)**
**BI 315 Systems Physiology (fall & spring)**
***NE/BI 445 Cellular and Molecular Neurophysiology (spring)**
***NE/BI 455 Developmental Neurobiology (spring)**
***NE/BI 481 Molecular Biology of the Neuron (fall)**

NE/BI 449 Neuroscience Design Lab (fall)
NE/BI 520 Sensory Neurobiology (fall)
NE/BI 542 Neuroethology (spring)
**NE/BI 545 Neurobiology of Motivated Behavior (spring)**
***NE/BI 525 Biology of Neurodegenerative Diseases (fall & spring)**
***NE/BI 535 Translational Research in Alzheimer’s Disease (spring)**
**BI 599 Molecular Biology of the Synapse**

**Psychology**

PS 222 Perception (fall & spring)
**NE/PS 212 MATLAB for Brain Science (fall & spring)**
**NE/PS 234 Psychology of Learning (fall & spring)**
**NE/PS 322 Experimental Psychology: Physiology (spring)**
NE/PS 327 Experimental Psychology: Perception (new spring ’16)
***NE/PS 333 Drugs and Behavior (fall & spring)**
***NE/PS 337 Memory Systems (fall)**
***NE/PS 338 Neuropsychology (fall)**
NE/PS 340 Intro to Comp Models of Skilled Action (spring)
***NE/PS 528 Brain Mapping (fall)**
***NE/PS 529 Neuroplasticity (fall)**
**NE/PS 530 Neural Models of Memory (spring)**
**NE/PS 544 Developmental Neuropsychology (fall)**

**Undergraduate Program in Neuroscience**

**NE 499 Clinical Neuroscience (new spring ’16)**

**Health Sciences (Sargent College)**
SAR HS 361/NE 360 Introduction to Computational Models of Hearing (*fall*)

Chemistry
CH 203 Organic Chemistry

Computer Science
CS 111 Intro to Computer Science I
CS 112 Intro to Computer Science II
CS 542 Machine Learning
CS 565 Data Mining

Mathematics and Statistics
MA 242 Linear Algebra
MA 226 Differential Equations
MA 416 Intermediate Stats
MA 421 Modern Stat Modeling and Data Analysis
MA 565 Math Models in Life Sciences
MA 578 Bayesian Stats

**STEP III. PLANNING FOR EFFECTIVE, EFFICIENT, EQUITABLE, AND SUSTAINABLE COURSE STAFFING**

NE 101, required *every fall*; Dr. Lipton (Neuroscience) is committed to teaching this course in the fall. (Note: NE 101 satisfies a Natural Science Divisional requirement. Nearly 60% of the class is non-majors; almost 20% of the class is non-CAS students.)

NE 102, required *every spring*; Dr. Pastorino (Neuroscience) is committed to teaching this course in the spring.

NE 202/PS 339, required *every spring*; Professor Somers (Neuroscience/Psychology) is committed to teaching this course.

NE 203, required *every fall*; Professors Gavornik and Cruz-Martin (Biology/Neuroscience) co-teach the lecture and Professor Lin (Biology/Neuroscience) directs the lab for this course.

NE 204, required *every spring*; Professor Kramer (Neuroscience/Mathematics & Statistics) will return from sabbatical to teach this course beginning spring ’17.

**STEP IV: EXECUTIVE SUMMARY OF UPDATES AND FUTURE PLANNING**

1. **UPDATES:** PLEASE LIST ALL MAJOR UPDATES THAT YOU MADE TO THIS DOCUMENT THIS YEAR.
   - Dr. Shoai Hattori joined the undergraduate neuroscience program last year to teach our introductory labs (NE 102 & NE 203), and serve as an academic advisor for undergraduate neuroscience majors. He has been an exceptional addition to our team, helping to further develop our labs and ensure continuity across sections, improving communication among students and staff; and he is working closely with our student organization on their outreach efforts. His instructor ratings are the highest we’ve ever seen, and student interest in the lab courses is off the charts.
• NE/PS 212 has been a much needed quantitative/computational addition to our curriculum, immersing students to data analysis, programming, and statistical methods used in later courses, faculty labs, and employment after graduation.

2. GOALS AND PLANNING
A. THE CURRICULAR CONTEXT.
• Due to faculty retirements in Biology, NE/BI 554 (Neuroendocrinology) is no longer offered. Without this course, our curriculum lacks any substantive exposure to this vibrant subfield of neuroscience.

• Integrated Science Experience I & II. Beginning spring 2016 we will be offering two new integrated lab courses for first and second year science majors. The freshman course (NE/BI/CH 116) will be a fully integrated lab course, replacing CH 102, BI 108, and NE 102 labs. Students will continue to register for the regular lecture. In fall 2016 we will be offering the second course in the sequence (NE/BI/CH 218), a combined principles of neuroscience, cell biology, organic chemistry lab course. Students will continue to take the regular lecture for each course.

• Dr. Lipton is co-developing with faculty in Chemistry and Computer Science a new natural science course for the Core Curriculum (CC 212).

• Together with the Department of Philosophy, we are preparing to submit a proposal for a new joint major in Philosophy & Neuroscience. We have been in regular contact with Dean Jackson during the development process, and the proposal was approved by both the philosophy and neuroscience faculty.

LOOKING TO THE FUTURE.
• NEUROSCIENCE WRITING PROGRAM. We would like to develop a Writing in the Discipline component for neuroscience that will bridge NE 102 and NE 203 and provide credit for WR 150. With an emphasis on experimental design, data acquisition and analysis, and dissemination, our lab course sequence provides a natural disciplinary context where students may develop communication skills alongside experimental and technical aptitude. Just as we gradually introduce the process of research across both courses, students will engage in a sequence of writing assignments that comprise elements of a scientific article, a popular press essay targeted at a non-scientific audience, and a grant application. Furthermore, peer review would be a central feature throughout the entire process.

• NEUROSCIENCE HONORS PROGRAM. We would like to build a Neuroscience Honors Program with the central features of our curriculum as its foundation, with the following elements:
  • Incorporate into each of our three core lab/lecture courses (NE 102, 203, and 204) an honors laboratory section; honors students will be required to successfully complete all three sections to remain in the Departmental Honors program and graduate with honors
  • Students will be admitted through an application process only after they complete their first semester
• Admission will be based in part on an overall GPA of 3.2 or higher; no NE grade lower than 3.3
• To graduate with Neuroscience Honors students will have to successfully complete a Senior Thesis during senior year
  o Students will have to complete at least one semester of a Directed Study prior to starting in their Senior Thesis

We currently lack the manpower to develop and thus implement (organize, oversee, coordinate) either program. Over the current academic year we plan to map out a strategy to move forward.

B. SPECIFIC COURSE NEEDS. No changes to kind, size, format, or offering patterns in our curriculum.

C. COURSE STAFFING.
   1. Part-time Lecturers.

NE 499 – (spring semester, annually). Dr. James Otis, Professor of Neurology (BUSM) has created and will be offering a new clinical neuroanatomy course for neuroscience majors beginning spring 2016. As a member of the BUSM faculty, he qualifies as a part-time lecturer here on the Charles River Campus.