Date: April 25, 2016  
To: Christoph Zeller, Ph.D., Chair, Committee on Educational Programs  
From: David Zald, Ph.D. (Director of the Interdisciplinary Neuroscience Program) and Elizabeth Catania, Ph.D. (Director of Undergraduate Studies)  

We are submitting a revised proposal for changes to the interdisciplinary major and minor in Neuroscience. We have made the requested revisions from your April 20th email based on: 1) the CEP’s determination that it would be inaccurate to totally remove chemistry from the list of prerequisites for the minor because CHEM 1601,1601L is a prerequisite for one of the required BSCI classes (BSCI 1510); and 2) the need to fix several formatting and course ordering issues in the catalog copy. We apologize that not all of these corrections were included in the last document version sent to the committee, we appeared to have had a version control issue, and I have now verified that the newly submitted version incorporates all comments from the earlier technical review and your comments sent last week. An updated rationale for the proposed changes appears on the next page, and is followed by a revised version of the catalog copy with tracked changes and then the clean catalog copy. The new version of the catalog copy is marked April 25th in order to mark this as a final version. Thank you for your assistance with these proposed changes.

Sincerely,

David H. Zald, Ph.D.  
Professor of Psychology & Psychiatry  
Director of the Interdisciplinary Neuroscience Program for Undergraduates
Rationale for Changes to NSC major and minor

The proposed changes are an attempt to update the major and minor to reflect the need for a background in statistics and computer programming in many sub-fields of the Neuroscience discipline. There is only one substantive change to the major involving the math requirement. However, we have included several other changes in order to correct several mistakes that we noted in the catalog while doing revisions and updates to combinations of classes that are already processed as mass variances, but have not been updated in the catalog. These include: 1) the removal of PSY 3640 from electives: this was a typo and this course is not a Neuroscience course; 2) the removal of PSY 3620 from related electives-- this course was added as an Elective Course several years ago, but was mistakenly double listed as a related elective; and 3) change the way the Physics courses are listed—we have allowed students to choose any combination of the approved Physics courses and want to update the catalog to reflect this directly.

The one substantive change to the major is the alteration in the name of the “Math” prerequisite section of the major to “Math, Statistics, Computer Science” and the addition of 2 introductory Computer Science courses (CS 1101, Programming and Problem Solving, or 1103, Introductory Programming for Engineers and Scientists) that can fulfill the second half of this requirement. At present, the major requires one semester of calculus and then gives the option of a second semester of calculus or a statistics course. Many neuroscience labs now require a significant amount of computer programming skills for creating or analyzing data and these courses will serve as an introduction to these skills for students that wish to specialize in related research areas. Therefore, Neuroscience majors will need to complete one semester of Calculus (as is currently the case) and then complete the requirement either with a second semester of Calculus, one of several relevant Statistics courses, or a course in Introductory Computer Programming. It should be noted that both of these Computer Science courses are already approved as Related Electives for Neuroscience majors.

We are proposing several changes to the minor in order to make it more cohesive with the major and also to make it more relevant to students wishing to get a background and introduction to neuroscience. We are proposing decreasing the prerequisite of two semesters of General Chemistry with Lab to one semester. The Steering Committee felt that a 2nd semester of General Chemistry is less relevant to getting an overview of neuroscience as a field than having an appropriate introduction to research methods such as statistics and computer programming. The first semester of general chemistry (CHEM 1601/1601L) is retained as this is a prerequisite for BSCI 1510, which is a required course for the NSC minor. The new requirement of either a statistics or Computer Science course (the same courses that will count towards the major) is added in place of the second semester of General Chemistry. This modification will change the Neuroscience minor from 15 credit hours to 18 credit hours, however, the reduction of 4 credit hours of required General Chemistry, which did not count towards the minor, will no longer be necessary, effectively reducing the total number of hours a student would have to take to earn a Neuroscience minor by one credit.
We have also reorganized the Neuroscience Elective class choices to mirror those in the major—that is, now instead of choosing 1 of 2 upper level Biological Sciences courses (BSCI 3252 or 3256) and then 3 other (9 credits) courses from any of the Neuroscience electives, minors will choose 2 courses from the “Cellular and Molecular Neuroscience” track of electives and 2 from the “Systems, Integrative and Cognitive” track. The minor was originally designed so that it would be easy for students to have courses from 3 different disciplines covered in the minor. However, with the addition of the Statistics/Computer Science requirement and the much larger number of courses now available to students in both the “Cellular and Molecular Neuroscience” track and the “Systems, Integrative and Cognitive” track, it will not be hard for students to meet that requirement. We have added a single sentence to point out that students must fill this requirement from at least 3 different departments or programs.

In several places we made edits to improve clarity, and (in response to technical review) to correct issues with the original catalog copy. This included: 1) changes in punctuation formatting and course ordering; 2) indicating that courses can come from both departments and programs in places where there are breadth requirements; 3) alteration of wording regarding where research credits for NSC 3863, or NSC 4999 can (or cannot count toward requirements; and 4) deletion of an unnecessary sentence regarding when honors research should begin. We believe that these changes make the text easier to read and the new version adheres better with the expected formatting of the catalog.

We have attached screen shots of emails in support of adding courses to the major and/or minor from the chairs of the departments of Biology, Psychology, Peabody Psychology and Computer Science.

The substantive changes were voted on during a Steering Committee meeting on 12/17/15. There were 6 of 8 members present and all changes were unanimously approved by those members present.

Supporting Emails by relevant departments appear below.
Hi Liz:

Thanks for your note. I support the changes you propose to the Neuroscience major and minor, and in particular approve of listing BSCI 3270 Biostatistics as a possible statistics course for the minor.

Best,

Doug

Douglas G. McMahon, Ph.D.
Steeleman Professor of Biological Sciences and Chair
Department of Biological Sciences
Vanderbilt University
Tel. 615-343-3441
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Fax. 615-343-5707

From: "Catania, Elizabeth Haldeman"
Date: Thursday, February 4, 2016 at 9:51 AM
To: Douglas McMahon
Subject: Request to add BSCI course to Neuroscience minor

Hi Doug,

We are in the process of submitting a change to the Neuroscience major and minor to the CEP. One of the changes will be adding either a stats or computer science course as part of the minor requirements. This will parallel the current major requirement (with the addition of the Computer Science courses as options for both) and give minor students the choice to take one of the following courses to complete the requirement: BSCI 3270, PST 2106, PST PC 2110, CS 1181 or CS 1180. We currently have a total of 17 students minoring in Neuroscience and so don't expect there to be a large change in the demand for any of these courses.

I'm writing to request your permission to add BSCI 3270 to the minor. If you could send an email back with a response that we could include with the proposal I'd greatly appreciate it.

Thanks,

Liz

Elizabeth Catania, Ph.D.
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Director of Undergraduate Studies in Neuroscience
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Office: LTM20, MRB III
Phone: 615-343-3136
460 21st Ave, S
Nashville, TN 37232
Neuroscience

DIRECTOR David H. Zald
DIRECTOR OF UNDERGRADUATE STUDIES Elizabeth Catania

Steering Committee
PROFESSORS Vivien A. Casagrande (Medicine), René Marois (Psychology), Douglas G. McMahon (Biological Sciences),
Mark Wallace (Medicine)
ASSISTANT PROFESSORS Elizabeth Catania (Neuroscience),
Alexander Maier (Psychology)
SENIOR LECTURER Leslie M. Smith (Psychology)

The study of the nervous system is an interdisciplinary enterprise that draws upon a variety of scientific
disciplines ranging from molecular biology and biophysics to computational science and engineering to the
study of behavior and cognition. To meet the challenge of providing training for entry into this exciting and
growing field, Vanderbilt offers an interdisciplinary program of concentration in neuroscience that utilizes
expertise from several departments within the university. The program consists of three components. The
first provides for a broad foundation in the basic sciences and mathematics. Second, the program provides
for exposure to each of the general areas of neuroscience including courses in cellular/molecular, systems,
and integrative/cognitive neuroscience. This course work is supplemented with exposure to the laboratory
techniques utilized in neuroscience research. Finally, the program allows students to pursue more work in
the specific sub-disciplines of neuroscience and in areas of inquiry related to neuroscience through elective
courses. Students are especially encouraged to participate in research in the laboratories of neuroscience
faculty under the auspices of the undergraduate research courses. More extensive research experience is
available through the Honors Program in Neuroscience. For additional information, see
as.vanderbilt.edu/neuroscience.

NOTE: New course numbers took effect in fall 2015. Former course numbers are included in course descriptions in this catalog and at
this website: registrar.vanderbilt.edu/faculty/course-renumbering/course-lookup.

Program of Concentration

Students majoring in neuroscience are required to complete a core of introductory courses in mathematics,
chemistry, physics, and biology that provide the broad scientific background necessary to the study of
neuroscience. The neuroscience major consists of 39 credit hours of course work that includes 8 credit
hours of organic chemistry and 31 credit hours of neuroscience and related courses distributed among
specific disciplines associated with the study of neuroscience. The areas and associated course options are
listed below. Excluding research credit (3861, 3862, 3863, 3864, and 4999), the neuroscience and related
courses must be drawn from at least two departments or programs. Students seeking a second major
within the College of Arts and Science may count a maximum of 6 credit hours of 2000-or-higher-level
course work to meet the requirements of both majors.

Required Math and Science Courses

Biology Sciences (8 credit hours)
BSCI 1510, 1511, 1510L, and either 1511L or 1512L.

Chemistry (8 credit hours)
CHEM 2221 or 2211 or 2221; CHEM 2222 or 2212 or 2222; and CHEM 2221L and 2222L.

Mathematics, Statistics, Computer Science (6-8 credit hours)
Option 1: MATH 1100, 1200, or 1300; and one of MATH 1201, 1301, BSCI 3270, PSY 2100, PSY-PC 2110,
CS 1101 or 1103. Option 2: MATH 1100 and either BSCI 3270 or PSY 2100 or PSY-PC 1400.

Physics (8 credit hours)
Option 1: PHYS 1501 or 1601; PHYS 1502 or 1602; PHYS 1502, 1501L or 1601L; and PHYS 1502L or
1602L.
Option 2: PHYS 1601, 1602, 1601L, and 1602L.
Option 3: PHYS 1901 and 1902.

Neuroscience Courses

Introduction to Neuroscience (3 credit hours required)
Neuroscience NSC 2201.
Cellular and Molecular Neuroscience (6 credit hours required)
Biological Sciences BSCI 3252, 3256; Neuroscience NSC 3235, 3240, 3245, 3260, 3269, 3891.

Systems, Integrative, and Cognitive Neuroscience (6 credit hours required)
Biological Sciences BSCI 3230, 3254; Neuroscience NSC 4964, 3270, 3274, 3892, 4961, 4969; Psychology PSY 3120, 3620, 3700, 3750, 3120, 3620, 3760, 3765, 3775, 3780, 3785.

Neuroscience Laboratory (4 credit hours required)
Neuroscience NSC 3861, 3862.

Neuroscience Electives (6 credit hours required)
Two additional courses from the Cellular and Molecular Neuroscience and Systems, Integrative and Cognitive Neuroscience courses listed above. One semester of Neuroscience NSC 3863 may be used to count for one elective course.

Related Course Electives (6 credit hours required; two courses not used to satisfy the Required Math and Science course requirement above.)
Biological Sciences BSCI 2201, 2201L, 2210, 2210L, 2520, 3270, 4265; Biomedical Engineering BME 3100, 3101; Chemistry CHEM 2100, 3310, 3710, 4720, 3310; Computer Science CS 1101, 1103; Mathematics MATH 2300, 2400, 2420; Philosophy PHIL 3616, 3630; Psychology PSY 2100, 3100, 3100, 3620, 3625, 3705, 3715.

Honors Program
Superior students with a strong interest in research are encouraged to consider the Honors Program in Neuroscience. Normally a student will apply to enter the Honors Program in the spring second semester of the junior year and assemble an Honors Committee that will consist of the research mentor and at least two other appropriate members of the faculty. The student should begin within the program the following semester. Entrance into and satisfactory completion of the Honors Program requires that students maintain a cumulative overall grade point average of 3.3 and a grade point average of 3.3 in courses counting toward the neuroscience major. Honors candidates must meet all the normal requirements for the neuroscience major, but students are expected to complete at least 8 credit hours of research course work (from Neuroscience NSC 3861, 3862, 3863, 3864, and/or 4999). Three of these research-credit hours may count toward neuroscience elective course work. As part of this research course work, the candidate will be expected to write an honors thesis. The candidate must present an honors thesis during the final semester in residence, and satisfactorily pass an oral examination by the student’s Honors Committee. Students interested in becoming honors candidates should consult with the director of honors and independent study. For more information on the Honors Program, please see as.vanderbilt.edu/neuroscience/the-honors-program.

Minor in Neuroscience
This program provides a foundation of knowledge in neuroscience that is appropriate for students majoring in a related discipline or who have a general interest in the nervous system. As prerequisites, students are required to complete two CHEM 1601 and 1601L, BSCI 1510–1510L, 1511, and either 1511L or 1512L. The minor program consists of 18 credit hours of course work distributed as follows:

Neuroscience NSC 2201, (3 credits)
Biological Sciences 3252 or 3256, One course 3 credits in Statistics/Computer Science: BSCI 3270, PSY 2100, PSY-PC 2110, CS 1101 or CS 1103, (3 credits)

At least 9 additional 6 credit hours (3 courses) chosen from the courses listed as “Neuroscience “Cellular and Molecular Neuroscience” Courses” and additional

and 6 additional-credit hours (2 courses) chosen from the courses listed as “Systems, Integrative and Cognitive Neuroscience” in the Program of Concentration in Neuroscience, except that research courses (Neuroscience 3860, 3861, 3862, 3863, 3864, and 4999) do not count toward the minor.

The chosen courses counting towards the 18 credit hours must come from at least 3 different departments or programs/disciplines (e.g. NSC, PSY, and BSCI).
Research courses (NSC 3860, 3861, 3862, 3863, 3864, and 4999) do not count towards the minor.
Neuroscience
DIRECTOR David H. Zald
DIRECTOR OF UNDERGRADUATE STUDIES Elizabeth Catania
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growing field, Vanderbilt offers an interdisciplinary program of concentration in neuroscience that utilizes
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first provides for a broad foundation in the basic sciences and mathematics. Second, the program provides
for exposure to each of the general areas of neuroscience including courses in cellular/molecular, systems,
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techniques utilized in neuroscience research. Finally, the program allows students to pursue more work in
the specific sub-disciplines of neuroscience and in areas of inquiry related to neuroscience through elective
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courses must be drawn from at least two departments or programs. Students seeking a second major within
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work to meet the requirements of both majors.

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Mathematics, Statistics, Computer Science (6-8 credit hours)
MATH 1100, 1200, or 1300; and one of MATH 1201, 1301, BSCI 3270, PSY 2100, PSY-PC 2110, CS 1101, or
1103.
Physics (8 credit hours)
PHYS 1501 or 1601; PHYS 1502 or 1602; PHYS 1501L or 1601L; and PHYS 1502L or 1602L.
Neuroscience Courses
Introduction to Neuroscience (3 credit hours)
NSC 2201.
Cellular and Molecular Neuroscience (6 credit hours)
BSCI 3252, 3256; NSC 3235, 3240, 3245, 3260, 3269, 3891.
**Systems, Integrative, and Cognitive Neuroscience** (6 credit hours)
BSCI 3230, 3254; NSC 3270, 3274, 3892, 4961, 4969; PSY 3120, 3620, 3700, 3750, 3760, 3765, 3775, 3780, 3785.

**Neuroscience Laboratory** (4 credit hours)
NSC 3861, 3862.

**Neuroscience Electives** (6 credit hours)
Two additional courses from the Cellular and Molecular Neuroscience and/or Systems, Integrative and Cognitive Neuroscience courses listed above. NSC 3863 may be used to count for one elective course.

**Related Course Electives** (6 credit hours; two courses not used to satisfy the Required Math and Science course requirement above.)
BSCI 2201, 2201L, 2210, 2210L, 3270, 4265; BME 3100, 3101; CHEM 2100, 3310, 3710, 4720; CS 1101, 1103; MATH 2300, 2400, 2420; PHIL 3616, 3630; PSY 2100, 3100, 3600, 3625, 3705, 3715.

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- **NSC 2201.**
- 3 credit hours in Statistics/Computer Science: BSCI 3270, PSY 2100, PSY-PC 2110, CS 1101 or 1103.
- 6 credit hours chosen from the courses listed as “Cellular and Molecular Neuroscience.”
- 6 credit hours chosen from the courses listed as “Systems, Integrative and Cognitive Neuroscience.”

The chosen courses counting towards the 18 credit hours must come from at least 3 different departments or programs (e.g. NSC, PSY and BSCI).

Research courses (NSC 3860, 3861, 3862, 3863, 3864, and 4999) do not count towards the minor.