Academic Year 2024-2025 Neuroscience Assessment Report

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Mission

The mission of the Neuroscience Program at the University of San Francisco is to train students who will apply a foundational knowledge of neuroscience to promote social justice, advocate for societal attitudes that embrace neurodiversity and ensure neurological and mental health equity.

The Neuroscience Major at USF will equip students with foundational knowledge of how the brain and the rest of the nervous system function, which they can then apply to a wide variety of careers.

In addition to a foundational understanding of neuroscience, students will also learn about the social and ethical implications of neuroscience applications. Students will use critical thinking, skeptical inquiry and a scientific approach to understanding the nervous system.

Students will be educated about racially- and culturally-motivated health inequities, as well as atypical brain development trajectories, in light of proposed remedies to these injustices.

Students will participate in a multidisciplinary community capable of including science and non-science members equally.

Program Learning Outcomes

Upon completion of the major, students will be able to:

1. Discuss the major concepts, theoretical perspectives, and empirical approaches in Neuroscience
2. Investigate basic problems in neuroscience by applying empirical methods, including designing and implementing research protocols and critically evaluating and interpreting data
3. Examine neuroscientific content in the broader context of the whole person as an individual and member of society
4. Evaluate the complexity of sociocultural, neurodevelopmental, and neurological diversity, especially as it pertains to mental health and the conditions under which all humans can thrive.
5. Synthesize and communicate neuroscientific information effectively in a variety of formats

Curriculum map at a glance

Program Learning Outcome	1	2	3	4	5
Year 1					
NEUR 101: Intro I: Cells and Circuits	+		+		
NEUR 101L (Lab)		+	+		
NEUR 102: Intro II: Brain Basis of Behavior	+			+	
NEUR 102L (Lab)		++	+		+
NEUR 103: Neurodiversity, Equity, & Ethics				+	+
Year 1 or 2					
BIOL 105 or 115	+	+	+		
BIOL lab 105L or 116		++			
Additional foundational course (4 units) CHEM, CS, MATH, PHIL, PSYC, & PHYS options					
Year 2					
NEUR 201: Research Methods and Data Analysis for Cellular Neuroscience	++	++			
NEUR 202: Research Methods and Data Analysis for Cellular Neuroscience		+++			++
Year 3					
Neur 3XX	+++	++	++		
Major elective options (16 units) BSDS, CS, MATH, PHIL, & PSYC options					
Year 4					
401 Adv. Topics			+++		+++
402 Adv. Project		+++			+++
405 CEL		++	++		
501 Honors Proposal			++++	++++	
502 Honors Analysis & Report		++++			++++

CURRICULUM MAP

Topics & SKILLS reword of PLOs:

Here, we break the PLOs into topics and skills to assist with readability and visualization of learning goals:

Topics: *What will students be learning about?*

Skills: *What will they be learning to do?*

1. Concepts, theories, & approaches: DISCUSS IDEAS
2. Methods, research design, data interpretation: INVESTIGATE PROBLEMS
3. Nervous system as part of whole person, whole society: EXAMINE EVIDENCE
4. Culture, development, neurodiversity, mental health, human thriving: EVALUATE COMPLEXITY
5. Science communication, tell the world: DISTILL AND COMMUNICATE

Mastery level:

\+ = introduced
++ = developed
+++ = mastered
+ = also a dominant theme, but not the primary 1-2 foci of the course

	1: DISCUSS IDEAS Concepts, theories, & approaches	2: INVESTIGATE PROBLEMS Methods, research design, data interpretation	3: EXAMINE EVIDENCE Nervous system as part of whole person, whole society	4: EVALUATE COMPLEXITY Culture, development, neurodiversity, mental health, human thriving	5: DISTILL AND COMMUNICATE Science communication, tell the world
Year 1 Course Descriptions **NEUR 101:** This course focuses on fundamental aspects of cellular neurophysiology and circuitry. Topics include exploration of electrophysiological properties of neurons, synaptic structure and function and synaptic plasticity, as well as network-building in the brain. **NEUR 102:** This course focuses on basic brain function and introduces students to fundamental features of human behavior and their underpinnings. Issues of mental health equity, neurodiversity and developmental differences and the role that society plays in shaping brains and behavior will be introduced. **NEUR 103:** This interdisciplinary course will investigate the emerging concepts of neurodiversity and neurodivergence—terms originally developed by autistic activists and self-advocates seeking to depathologize autism and other forms of neurological, mental, and cognitive difference. Course materials will incorporate perspectives from disability studies, the history of science, cultural studies, and feminist and queer theory. Topics may also include how neurodivergence enters aesthetic representation by examining cultural texts including memoirs, films, and performance and visual art and the role of social movements such as neurodiversity in shaping representations of mental disability and difference. The course will also address existing and historical inequities related to mental health, across race, gender and other socio-cultural constructs.					
NEUR 101: Intro I: Cells and Circuits	+		+		
NEUR 101L (Lab)		+	+		

NEUR 102: Intro II: Brain Basis of Behavior	+			+	
NEUR 102L (Lab)		++	+		+
NEUR 103: Neurodiver-sity, Equity, & Ethics				+	+

Year 1 or 2 Biology course descriptions

Students must take EITHER BIOL 105/105L OR BIOL 115/116, ideally in the first two years.

105: Introduction to the principles of biology with emphasis on molecular biology, cell physiology, genetics, evolution, and ecology for science majors and pre-health students.
105L: Laboratory exercises examining molecular, cellular, genetic, and ecological principles.

115: Survey of the functions of tissues, organs, and organ systems of the human body for non-Biology majors.
116: Laboratory exercises examining the function of the human body.

BIOL 105 or 115	+	+	+		
BIOL lab 105L or 116		++			

Additional foundational course options (4 units)

This course may serve various program learning outcomes, depending upon students' selections.

Students select one of the following to take:

PSYC 101 - Introduction to Psychology
CHEM 111 - General Chemistry I & CHEM 112 - Laboratory (with CHEM 186 recitation, 5 units total)
MATH 109 - Calculus & Analytic Geom I
PHIL 248 - Ethics of Technology
PHIL 251 - Mind, Freedom & Knowledge
PHYS 100 - Introductory Physics I & PHYS 100L - Laboratory
PHYS 110 - General Physics I & PHYS 110L - Laboratory

Year 2 course descriptions

NEUR 201: NEUR 201 introduces students to research methods, experimental design, and data analysis for neuroscience. This course focuses on techniques for interrogating the brain at the cellular level and constitutes one half of a two-semester long sequence, with NEUR 202 providing analogous focus at the cognitive level. Through an exploration of cutting-edge neuroscientific research techniques, students are exposed to modern computer programming environments for data analysis as well as the foundational descriptive and inferential statistical tools necessary to draw empirical conclusions from neural datasets.

NEUR 202: NEUR 202 introduces students to modern research methods, experimental design, and data analysis for cognitive neuroscience. This course constitutes the second half of a two-semester long sequence, with NEUR 201 providing analogous focus at the cellular level. Through an exploration of cutting-edge neuroscientific research, students will experience modern computer programming environments for data analysis and become proficient in foundational

descriptive and inferential statistical tools necessary to draw empirical conclusions from neural datasets.					
NEUR 201: Research Methods and Data Analysis for Cellular Neurosci-ence	++	++			
NEUR 202: Research Methods and Data Analysis for Cellular Neurosci-ence		+++			++

Year 3 course options and descriptions

Students take breadth requirements. Some options will be available to students as early as their second year (having only 101 and/or 102 as prerequisites, e.g. Cognitive Neuroscience). Others will only be available later (having 201 and/or 202 as prerequisites–e.g. Computational Neuroscience).

Breadth course options (Students choose two):
NEUR 301 - Cellular and Molecular Neuroscience (prerequisite: NEUR 101)
NEUR 302 - Cognitive Neuroscience (prerequisite: NEUR 102)
NEUR 303 - Sensation and Perception (prerequisite: NEUR 101)
NEUR 3XX - Computational Neuroscience (prerequisite: NEUR 201 & 202)
NEUR 3XX - Neuroscience-informed User Design (prerequisites pending course development)
NEUR 3XX - Social and Affective Neuroscience (prerequisites pending course development)
NEUR 3XX - Neuroethics (prerequisites pending course development)

NEUR 301, Cellular & Molecular Neuroscience (tentative description): This course will explore fundamental principles of cellular and molecular neuroanatomy, physiology, and genetics. Students will deepen their understanding of fundamental processes of neuronal communication, development, and extrinsic and intrinsic influences on human and animal behavior. Studies using a variety of model organisms and in vitro approaches will be featured, and students will participate in simulations of pharmacological, behavioral, and genetic manipulations.

NEUR 302, Cognitive Neuroscience: This course will explore influential findings in cognitive neuroscience, digging deeply into classic study designs to illuminate relationships between evidence and theory. Students will increase their understanding of the neural bases of cognitive functions like emotion, memory, and attention. Students will also develop skills in developing and testing hypotheses, selecting research methods, interpreting results in multiple graphical and written formats, and discussing the context of these results and implications for future research.

NEUR 303, Sensation & Perception (tentative description): This course introduces students to the scientific study of human sensation and perception—the processes by which the brain detects, interprets, and gives meaning to sensory information from the external world. Students will explore how information in the form of vision, hearing, touch, taste, and smell are encoded by the nervous system and integrated into coherent perceptual experiences. Students will gain an understanding of the overarching concepts and principles—such as sensory transduction and perceptual constancies—that unite sensory processing across modalities, and investigate the neural mechanisms underlying perceptual illusions. Through a mix of lecture, readings, discussions, hands-on demonstrations, and in-class activities, students will gain a deeper understanding of how human sensation and perception connects fundamental principles of brain function with our conscious experience of the world.

Neur 3XX	+++	++	++		

Major elective options (16 units)

These courses may serve various program learning outcomes, depending upon students' selections. Students may complete these during any year, depending upon completion of prerequisites.

Students select four of the following to take:
BSDS 100 - Intro to Data Science
CS 107 - Creative Coding and AI
CS 110 - Intro to Computer Science I
CS 283 - UX-Design for Non-Majors
MATH 110 - Calculus & Analytic Geom II
PHIL 204 - Philosophy of Science
PHIL 230 - Philosophy of Human Person
PSYC 319 - Cognitive Psychology
PSYC 326 - Learning and Memory
PSYC 351 - Human Neuropsychology

Year 4 course descriptions

Senior capstone: Students choose one of the following (401 or 402). Students must have completed at least one NEUR 3XX course.

401 Advanced Topics in Neuroscience (tentative): In this seminar-style course, students will read and analyze scientific journal articles, interpreting results and discussing broader impacts in class. This course will be offered to students who have completed all 100- and 200-level coursework along with at least one 300-level neuroscience course. Topics covered in this course will align with instructors' area of expertise.

402 Advanced Project in Neuroscience (tentative): In this seminar-style course, students will work toward proposing experiments of their own, guided through the process of background research and giving feedback on each others' designs in class. This course will be offered to students who have completed all 100- and 200-level coursework along with at least one 300-level neuroscience course. Topics covered in this course will align with instructors' area of expertise.

Community-engaged learning: Students

405, CEL in Neuroscience (tentative): Partnering with Bay Area technology companies, UCSF research labs, and NGOs/legal/political organizations, students will complete a semester-long internship. In class, students will convene to reflect on their experiences both in terms of long-term service to their community and contributions to their own career goals.

Optional Honors sequence (by application only, pending faculty availability):

501 Honors in Neuroscience I: Proposal Development (tentative): Limited to students pursuing an Honors in Neuroscience; admission is by application letter or approval of instructor. In this seminar students prepare a research proposal, including an IRB application, a literature review, and a detailed description of how the independent and dependent variables will be measured. Students will also critique the proposals of class members.

502 Honors in Neuroscience II: Data Analysis and Scientific Report (tentative): Limited to students pursuing Honors in Neuroscience. In this seminar students execute the research proposal developed in NEUR 501, including data gathering and analysis, as well as preparation of a written thesis and poster suitable for oral presentation. This course is completed in addition to the 62 units required for the neuroscience major.

401 Adv. Topics			+++		+++
402 Adv. Project		+++			+++

405 CEL		++	++		
501 Honors Proposal			++++	++++	
502 Honors Analysis & Report		++++			++++