

Cognitive Neuroscience

Cognitive neuroscience is the study of higher cognitive functions in humans and their underlying neural bases. It is an integrative area of study drawing primarily from cognitive science, psychology, neuroscience, and linguistics. There are two broad directions that can be taken in this concentration - one is behavioral/experimental and the other is computational/modeling. In both, the goal is to understand the nature of cognition from a neural perspective. The standard concentration for the Sc.B. degree requires courses on the foundations, systems level, and integrative aspects of cognitive neuroscience as well as laboratory and elective courses that fit within a particular theme or category such as general cognition, perception, language development or computational/modeling. Concentrators must also complete a senior seminar course or an independent research course. Students may also participate in the work of the Brown Institute for Brain Science, an interdisciplinary program that unites ninety faculty from eleven departments.

Standard Program for the AB degree

These are the new requirements approved by CCC effective Fall 2024. For existing concentrators graduating in 2024-25, the prior requirements can be found by selecting the Bulletin archive <https://bulletin.brown.edu/archive/2023-24/>

Common Core

Careers in Cognitive Neuroscience and related fields require familiarity with statistics. Therefore, the Cognitive Neuroscience concentration requires a course in Quantitative Methods (CPSY 0900 (<https://bulletin.brown.edu/search/?P=CPSY%200900>)). CPSY 0900 (<https://bulletin.brown.edu/search/?P=CPSY%200900>) is a prerequisite for research methods and laboratory courses, so concentrators should plan to take this course by their fourth semester. Students may substitute for CPSY 0900 (<https://bulletin.brown.edu/search/?P=CPSY%200900>) a comparable statistics course taught in another department, with the approval of a Cognitive Neuroscience concentration advisor. Consult with a concentration advisor for details. The department does not grant concentration credit for AP Statistics, regardless of score. We strongly recommend fulfilling the statistics requirement as a sophomore.

Another element in the Cognitive Neuroscience concentration is a course on research methods. Research Methods and Design (CPSY 1900 (<https://bulletin.brown.edu/search/?P=CPSY%201900>)) or Research Methods (CPSY 1901 (<https://bulletin.brown.edu/search/?P=CPSY%201901>)) is the preferred course for fulfilling this requirement. This course builds on the introductory statistics course and exposes students to a variety of topics in the psychological sciences: to empirical methods (e.g., surveys, chronometry, eye tracking, brain imaging), to common designs (e.g., factorial experimental, correlational, longitudinal), to research ethics, and to best practices of literature review. Other CPSY laboratory courses can be used to fulfill the research methods requirement; consult with a Cognitive Neuroscience advisor for lists of approved courses. The research methods requirement should be fulfilled before senior year.

Foundation

The goal of these requirements is to provide students with the foundational knowledge across Cognitive Neuroscience. Students are expected to have some background in Psychology, in Neuroscience, and in Computation. The requirements below afford students with the opportunity to gain background in each of these foundational areas and cannot be interchanged.

(A) Students are expected to take two courses that provide them with a foundation in cognition/psychology. The goal of taking courses in this category is to consider general principles of Psychological and Cognitive Science towards the study of Cognitive Neuroscience. The courses below are ones that teach fundamental topics related to Cognitive Neuroscience or that provide foundational knowledge that can be applied to neuroscientific principles and techniques. Cognition, Learning, Perception and Cognitive Neuropsychology are emphasized. Students

interested in Developmental Cognitive Neuroscience are encouraged to get a background in Cognitive Development (CPSY 0610), while students interested in Social Neuroscience are encouraged to get a background in Social Psychology (CPSY 0700). However, we do not accept both CPSY 0610 and CPSY S0700, as students interested in both of these topics are recommended to concentrate in psychology

(B) Students are expected to take one course that provides them with a foundation in neuroscience. The goal of taking a course in this category is to become familiar with the principles of cognitive neuroscience research and methods in one of the foundational domains.

Please note that CPSY 0400 and CPSY 0450 can be used for either the Foundation in Cognition/Psychology or the Foundation in Neuroscience requirement, but not both. That is, if either of these classes are used for the Foundation in Cognition requirement, students must take NEUR 0010 to satisfy Foundations in Neuroscience requirement; if either CPSY 0400 or CPSY 0450 are used for the Foundation in Neuroscience requirement, students cannot use them (or CPSY 0200) to satisfy the Foundations in Cognition/Psychology requirements.

(C) Because the study of Cognitive Neuroscience can focus on computational explanations for the relation between neural processes and behavior, students are required to take one course in programming or computational modeling.

Electives

The goal of the elective requirement is to construct a curriculum that provides a deeper understanding of Cognitive Neuroscience. Students should take five electives from the CPSY, NEUR, or CSCI departments, of which three must be at the 1000-level. Courses might also come from the APMA, COST or PHP departments (only with permission of concentration advisor). Extra foundation classes can be used as electives. However, students cannot construct a program of study that includes both CPSY 0950 and an introductory CSCI class as part of this requirement. Moreover, students must have at least three electives at the 1000-level. These elective courses must represent a specific coherent program of study, which is discussed with the concentration advisor.

Requirements for the A.B. degree

CPSY 0900	Statistical Methods	1
CPSY 1900 or CPSY 1901	Research Methods And Design Research Methods	1
Two Foundation Courses in Cognition from the following:		2
CPSY 0010	Mind, Brain and Behavior: An Interdisciplinary Approach	
CPSY 0100	Learning and Conditioning	
CPSY 0200 or CPSY 0400 or CPSY 0450	Human Cognition Cognitive Neuroscience Brain Damage and the Mind	
CPSY 0500 or CPSY 0550	Perception and Mind Science of Consciousness	
CPSY 0610 or CPSY 0700	Children's Thinking: The Nature of Cognitive Development Social Psychology	
One Foundation Course in Neuroscience from the following:		1
CPSY 0400	Cognitive Neuroscience	
CPSY 0450	Brain Damage and the Mind	
NEUR 0010	The Brain: An Introduction to Neuroscience	
One Foundation Course in Computation from the following:		1
CPSY 0950	Introduction to programming	
CPSY 1291	Computational Methods for Mind, Brain and Behavior	
CPSY 1492	Computational Cognitive Neuroscience	
CPSY 1950	Deep Learning in Brains, Minds and Machines	

Or any introductory CSCI course with a programming component such as:	
CSCI 0111	Computing Foundations: Data
or CSCI 0150	Introduction to Object-Oriented Programming and Computer Science
or CSCI 0170	Computer Science: An Integrated Introduction
or CSCI 0190	Accelerated Introduction to Computer Science
Five Approved Electives:	5
Five courses from the CPSY, NEUR, or CSCI department, of which three must be at the 1000-level	
Capstone: Independent Study (CPSY 1970, CPSY 1980) or approved seminar or lab	1
Total Credits	12

Honors Requirement

The Honors Program in Cognitive Neuroscience gives undergraduates a special opportunity to carry out a research project under the direction of a faculty member. The program also provides the opportunity for outstanding senior concentrators to receive their undergraduate degree with Honors. Participation in the program allows students to develop an understanding of research and acquire research skills and background.

Candidates for Honors in Cognitive Neuroscience must meet all of the requirements of the concentration as described above. Candidates submit their application for the program in semester 7. We encourage students to seek out a potential faculty mentor prior to semester 7. Candidates for Honors must have completed the Statistics CPSY 0900 (<https://bulletin.brown.edu/search/?P=CPSY%200900>) and Research Methods and Design (CPSY 1900 (<https://bulletin.brown.edu/search/?P=CPSY%201900>), Research Methods CPSY 1901 (<https://bulletin.brown.edu/search/?P=CPSY%201901>), or laboratory course) requirements before semester 7. Please refer to the CPSY Honors Program page for detailed information about the specific requirements for the Honors program in Cognitive Neuroscience.

Requirements for the Sc.B. degree

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Common Core

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Another element in the Cognitive Neuroscience concentration is a course on research methods. Research Methods and Design (CPSY 1900 (<https://bulletin.brown.edu/search/?P=CPSY%201900>)) or Research Methods (CPSY 1901 (<https://bulletin.brown.edu/search/?P=CPSY%201901>)) is the preferred course for fulfilling this requirement. This course builds on the introductory statistics course and exposes students

to a variety of topics in the psychological sciences: to empirical methods (e.g., surveys, chronometry, eye tracking, brain imaging), to common designs (e.g., factorial experimental, correlational, longitudinal), to research ethics, and to best practices of literature review. Other CPSY laboratory courses can be used to fulfill the research methods requirement; consult with a Cognitive Neuroscience advisor for lists of approved courses. The research methods requirement should be fulfilled before senior year.

Foundation

The goal of these requirements is to provide students with the foundational knowledge across Cognitive Neuroscience. Students are expected to have some background in Psychology, in Neuroscience, and in Computation. The requirements below afford students with the opportunity to gain background in each of these foundational areas and cannot be interchanged.

(A) Students are expected to take two courses that provide them with a foundation in cognition/psychology. The goal of taking courses in this category is to consider general principles of Psychological and Cognitive Science towards the study of Cognitive Neuroscience. The courses below are ones that teach fundamental topics related to Cognitive Neuroscience or that provide foundational knowledge that can be applied to neuroscientific principles and techniques. Cognition, Learning, Perception and Cognitive Neuropsychology are emphasized. Students interested in Developmental Cognitive Neuroscience are encouraged to get a background in Cognitive Development (CPSY 0610), while students interested in Social Neuroscience are encouraged to get a background in Social Psychology (CPSY 0700). However, we do not accept both CPSY 0610 and CPSY S0700, as students interested in both of these topics are recommended to concentrate in psychology.

(B) Students are expected to take one course that provides them with a foundation in neuroscience. The goal of taking a course in this category is to become familiar with the principles of cognitive neuroscience research and methods in one of the foundational domains.

Please note that CPSY 0400 and CPSY 0450 can be used for either the Foundation in Cognition/Psychology or the Foundation in Neuroscience requirement, but not both. That is, if either of these classes are used for the Foundation in Cognition requirement, students must take NEUR 0010 to satisfy Foundations in Neuroscience requirement; if either CPSY 0400 or CPSY 0450 of these classes are used for Foundation in Neuroscience, students cannot use them (or CPSY 0200) to satisfy the Foundations in Cognition/Psychology requirements.

(C) Because the study of Cognitive Neuroscience can focus on computational explanations for the relation between neural processes and behavior, students are required to take one course in programming or computational modeling.

Electives

The goal of the elective requirement is to construct a curriculum that provides a deeper understanding of Cognitive Neuroscience. Students should take five electives from the CPSY, NEUR, or CSCI departments, of which three must be at the 1000-level. Courses might also come from the APMA, COST or PHP departments (only with permission of concentration advisor). Extra foundation classes can be used as electives. However, students cannot construct a program of study that includes both CLPS950 and an introductory CSCI class as part of this requirement. Moreover, students must have at least three electives at the 1000-level. These elective courses must represent a specific coherent program of study, which is discussed with the concentration advisor.

Research Methods

Another element in the Cognitive Neuroscience concentration is a research methods course that builds on the introductory statistics course (which will be a prerequisite) but exposes students to a variety of topics in research of the mind: to empirical methods (e.g., surveys, chronometry, eye tracking, brain imaging), to common designs (e.g., factorial experimental, correlational, longitudinal), to research ethics, and to best practices of literature review. Alternatively, students may take an approved laboratory course.

ScB Requirements in Cognitive Neuroscience

To satisfy the ScB. requirements in the Cognitive Neuroscience concentration, one must satisfy all the AB requirements as well as take five (5) additional classes in STEM fields related to the concentration. The goal of this requirement is to provide students with a broader background in both the study of psychology and STEM fields in general. At least two (2) of those five classes must be in the CPSY Department. These two courses must be at the 1000-level. We strongly recommend that one of these courses be a laboratory course.

The other three classes can be from the following departments: APMA, BIOL, CSCI, CHEM, CPSY, MATH, NEUR, or PHYS. Courses from other STEM fields might be eligible with permission of the concentration advisor, but such courses must be related to a student's other courses, such as their electives. Courses from CPSY must be at the 1000-level to be considered for the Sc.B (no other department has that requirement). All courses must also be acceptable for the concentration requirements of a concentration administered by that department. For example, if a PHYS course is used to satisfy one of these requirements, it must be acceptable for a concentration in the PHYS department.

CPSY 0900	Statistical Methods	1
CPSY 1900 or CPSY 1901	Research Methods And Design Research Methods	1
Two Foundation Courses in Cognition from the following:		2
CPSY 0010	Mind, Brain and Behavior: An Interdisciplinary Approach	
CPSY 0100	Learning and Conditioning	
CPSY 0200 or CPSY 0400 or CPSY 0450	Human Cognition Cognitive Neuroscience Brain Damage and the Mind	
CPSY 0500	Perception and Mind	
CPSY 0550	Science of Consciousness	
CPSY 0610 or CPSY 0700	Children's Thinking: The Nature of Cognitive Development Social Psychology	
One Foundation Course in Neuroscience from the following:		1
CPSY 0400	Cognitive Neuroscience	
CPSY 0450	Brain Damage and the Mind	
NEUR 0010	The Brain: An Introduction to Neuroscience	
One Foundation Course in Computation from the following:		1
CPSY 0950	Introduction to programming	
CPSY 1291	Computational Methods for Mind, Brain and Behavior	
CPSY 1492	Computational Cognitive Neuroscience	
CPSY 1950	Deep Learning in Brains, Minds and Machines	
Or any introductory CSCI course with a programming component such as:		
CSCI 0111 or CSCI 0150 or CSCI 0170 or CSCI 0190	Computing Foundations: Data Introduction to Object-Oriented Programming and Computer Science Computer Science: An Integrated Introduction Accelerated Introduction to Computer Science	
Five Approved Electives:		5
Five courses from the CPSY, NEUR, or CSCI department, of which three must be at the 1000-level		
Five additional STEM courses of which two (2) must be CPSY courses at the 1000-level from the Electives of Capstone offerings (a lab is strongly recommended). Courses from APMA, BIOL, CSCI, CHEM, CPSY, MATH, NEUR, or PHYS will be considered and must be applicable to a concentration in that department.		5

Capstone: Independent Study (CPSY 1970, CPSY 1980) or approved seminar	1
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Total Credits **17**

Honors Requirement

The Honors Program in Cognitive Neuroscience gives undergraduates a special opportunity to carry out a research project under the direction of a faculty member. The program also provides the opportunity for outstanding senior concentrators to receive their undergraduate degree with Honors. Participation in the program allows students to develop an understanding of research and acquire research skills and background.

Candidates for Honors in Cognitive Neuroscience must meet all of the requirements of the concentration as described above. Candidates submit their application for the program in semester 7. We encourage students to seek out a potential faculty mentor prior to semester 7. Candidates for Honors must have completed the Statistics CPSY 0900 (<https://bulletin.brown.edu/search/?P=CPSY%200900>) and Research Methods and Design (CPSY 1900 (<https://bulletin.brown.edu/search/?P=CPSY%201900>), Research Methods CPSY 1901 (<https://bulletin.brown.edu/search/?P=CPSY%201901>), or laboratory course) requirements before semester 7. Please refer to the CPSY Honors Program page for detailed information about the specific requirements for the Honors program in Cognitive Neuroscience.