NEUROSCIENCE MAJOR

Students must also complete the Undergraduate Registration Requirement (https://catalogs.northwestern.edu/undergraduate/requirements-policies/undergraduate-registration-requirement/) and the degree requirements of their home school.

NOTE: This Catalog describes Weinberg College BA requirements that pertain to students who matriculated at Northwestern after spring quarter 2023. Refer to the Archives (https://catalogs.northwestern.edu/archives/) if you are following BA requirements described in the 2018-2019 through 2022-2023 editions.

Neuroscience major requirements

- 6 Neuroscience units (courses may not be double-counted with Allied Field courses or required Related Courses for the major)
  - 2 200-level NEUROSCI core courses (p. 1)
  - 2 courses with a primary focus on human behavior and the human brain (Group A Elective) (p. 1)
  - 2 courses with a primary focus on molecular, cellular, and systems-level mechanisms of brain function (Group B Elective (p. 1))
- 4 Allied Field units, at least 2 of which must be 300-level or above, chosen from one of the following areas. Courses may not be double-counted with the 6 Neuroscience units or required Related Courses for the Neuroscience major. No more than 2 Allied Field courses may be double-counted with another major and none with a minor.
  - Biology (p. 1)
  - Chemistry (p. 2)
  - Computation and Systems Modeling (p. 2)
  - Human Behavior and Cognition (p. 3)
  - Language and Human Communication (p. 3)
  - Ad hoc Allied Field - some other area chosen with approval of the director of undergraduate studies
- Related Courses (units depend on math and science sequences taken)
  - BIOL_SCI 201-0 Molecular Biology
  - Calculus sequence (p. 3)
  - General Chemistry sequence (p. 4) with labs
  - 1 Computer Programming (p. 4) course from list of approved courses
  - General Physics sequence (p. 4) with labs
  - 1 Statistics course (p. 4) from list of approved courses
- Laboratory Experience (p. 3) requirement
  - Courses that satisfy the laboratory experience requirement may also be used to satisfy another requirement for the major.
  - If two units of Undergraduate Research (398/399) are used for the Laboratory Experience requirement, they may also substitute for one course in an Allied Field.

Neuroscience Course Lists

Required Neuroscience core courses:

Course	Title
NEUROSCI 202-0	Cellular and Molecular Neuroscience
NEUROSCI 206-0	Systems and Behavioral Neuroscience

Neuroscience Group A Electives (students choose 2):

Course	Title
COG_SCI 210-0	Language and the Brain
CSD 303-0	Brain and Cognition
or PSYCH 327-0	Brain and Cognition
CSD 310-0	Biological Foundations of Speech and Music
PSYCH 110-0	Introduction to Psychology
PSYCH 228-0	Cognitive Psychology
PSYCH 244-0	Developmental Psychology
PSYCH 248-0	Health Psychology
PSYCH 324-0	Perception
PSYCH 328-0	Brain Damage and the Mind
PSYCH 330-0	Special Topics in Cognition/Neuroscience
PSYCH 391-0	Advanced Seminar in Cognition or Neuroscience (With approval of the director of undergraduate studies)
PSYCH 392-0	Advanced Seminar in Psychology (With approval of the director of undergraduate studies)

Neuroscience Group B Electives (students choose 2):

Course	Title
NEUROSCI 303-0	Molecular Mechanisms of Neuropsychopharmacology
NEUROSCI 304-0	Developmental Neurobiology
NEUROSCI 320-0	Animal Behavior
NEUROSCI 324-0	Neurobiology of Biological Clocks and Sleep
NEUROSCI 325-0	Neurobiology of Stress, Adversity, and Resilience
NEUROSCI 326-0	Neurobiology of Learning and Memory
NEUROSCI 350-0	Advanced Neurophysiology Laboratory
NEUROSCI 355-0	Neurogenetics of Behavior Laboratory
NEUROSCI 357-0	Neuroanatomy Laboratory
NEUROSCI 360-0	Neuroscience of Brain Disorders
NEUROSCI 365-0	Neurobiology of Prediction
NEUROSCI 370-0	Genetic and Circuit Analysis of Motivated Behavior
NEUROSCI 377-0	Neurobiology of Sensation and Perception
NEUROSCI 390-0	Topics in Neuroscience (With approval of the director of undergraduate studies)
BIOL_SCI 303-0	Molecular Neurobiology
BIOL_SCI 307-0	Brain Structure, Function, and Evolution
ES_APPM 370-1	Introduction to Computational Neuroscience
NEUROSCI 311-0	Biophysical Analysis of Neurons for ISP (With approval of the director of undergraduate studies, if not used in place of NEUROSCI 202-0)

Allied Field Course Lists

Biology (any 4 units, at least 2 of which must be 300-level or above)

Course	Title
300-level NEUROSCI courses listed under Neuroscience Group B Electives above are eligible if not being used as a Group B course.	
BIOL_SCI 202-0	Cell Biology
BIOL_SCI 203-0	Genetics and Evolution
BIOL_SCI 232-0	Molecular and Cellular Processes Laboratory (0.34 units)
BIOL_SCI 233-0	Genetics and Molecular Processes Laboratory (0.34 units)
BIOL_SCI 234-0	Investigative Laboratory (0.34 units)
BIOL_SCI 301-0	Principles of Biochemistry
BIOL_SCI 303-0	Molecular Neurobiology
BIOL_SCI 307-0	Brain Structure, Function, and Evolution

BIOL_SCI 310-0	Human Physiology
BIOL_SCI 315-0	Advanced Cell Biology
BIOL_SCI 319-0	Biology of Animal Viruses
BIOL_SCI 323-0	Bioinformatics: Sequence and Structure Analysis
BIOL_SCI 325-0	Animal Physiology
BIOL_SCI 328-0	Microbiology
BIOL_SCI 341-0	Population Genetics
BIOL_SCI 344-0	Anatomy of Vertebrates
BIOL_SCI 353-0	Molecular Biology Laboratory
BIOL_SCI 354-0	Quantitative Analysis of Biology
BIOL_SCI 355-0	Immunobiology
BIOL_SCI 356-0	Endocrinology
BIOL_SCI 358-0	Advanced Physiology Laboratory
BIOL_SCI 359-0	Quantitative Experimentation in Biology
BIOL_SCI 360-0	Principles of Cell Signaling
BIOL_SCI 361-0	Protein Structure and Function
BIOL_SCI 378-0	Functional Genomics
BIOL_SCI 380-0	Biology of Cancer
BIOL_SCI 381-0	Stem Cells and Regeneration
BIOL_SCI 390-0	Molecular Biology of Genome Editing and Engineering
BIOL_SCI 391-0	Developmental Biology
BIOL_SCI 393-0	Human Genomics
BIOL_SCI 395-0	Molecular Genetics
CHEM 215-1	Organic Chemistry I
CHEM 215-2	Organic Chemistry II
CHEM 215-3	Organic Chemistry III
CHEM 235-1	Organic Chemistry Lab I (0.34 units)
CHEM 235-2	Organic Chemistry Lab II (0.34 units)
CHEM 235-3	Organic Chemistry Lab III (0.34 units)
The six chemistry courses above have substantial overlap with the 217 and 237 series below. Consult with the Chemistry director of undergraduate studies for exact equivalencies.	
CHEM 217-1	Accelerated Organic Chemistry I
CHEM 217-2	Accelerated Organic Chemistry II
CHEM 217-3	Accelerated Organic Chemistry III
CHEM 237-1	Accelerated Organic Chemistry Laboratory I
CHEM 237-2	Accelerated Organic Chemistry Laboratory II

Chemistry (any 4 units, at least 2 of which must be 300-level or above)

Course	Title
CHEM 215-1	Organic Chemistry I
CHEM 215-2	Organic Chemistry II
CHEM 215-3	Organic Chemistry III
CHEM 235-1	Organic Chemistry Lab I (0.34 units)
CHEM 235-2	Organic Chemistry Lab II (0.34 units)
CHEM 235-3	Organic Chemistry Lab III (0.34 units)
The six courses above have substantial overlap with the 217 and 237 series below. Consult with the Chemistry director of undergraduate studies for exact equivalencies.	
CHEM 217-1	Accelerated Organic Chemistry I
CHEM 217-2	Accelerated Organic Chemistry II
CHEM 217-3	Accelerated Organic Chemistry III
CHEM 237-1	Accelerated Organic Chemistry Laboratory I
CHEM 237-2	Accelerated Organic Chemistry Laboratory II
also	
CHEM 220-0	Introductory Instrumental Analysis
CHEM 305-0	Chemistry of Life Processes
CHEM 307-0	Supramolecular Design of Materials and Nanostructures
CHEM 308-0	Design, Synthesis, and Applications of Nanomaterials
CHEM 316-0	Medicinal Chemistry: the Organic Chemistry of Drug Design and Action
CHEM 342-1	Thermodynamics
CHEM 342-2	Quantum Mechanics and Spectroscopy
CHEM 342-3	Kinetics and Statistical Thermodynamics
CHEM 348-0	Physical Chemistry for ISP
CHEM 350-1	Advanced Laboratory 1

Computation and Systems Modeling (any 4 units, at least 2 of which must be 300-level or above)

Course	Title
MATH 230-1	Multivariable Differential Calculus
MATH 230-2	Multivariable Integral Calculus
MATH 240-0	Linear Algebra
MATH 250-0	Elementary Differential Equations
The five courses above have substantial overlap with the 281, 285, 290, and 291 series below. Consult the Math director of undergraduate studies for exact equivalencies.	
MATH 281-1	Accelerated Mathematics for ISP. First Year
MATH 281-2	Accelerated Mathematics for ISP. First Year
MATH 281-3	Accelerated Mathematics for ISP. First Year
MATH 285-1	Accelerated Mathematics for MMSS: First Year
MATH 285-2	Accelerated Mathematics for MMSS: First Year
MATH 285-3	Accelerated Mathematics for MMSS: First Year
MATH 290-1	MENU: Linear Algebra and Multivariable Calculus
MATH 290-2	MENU: Linear Algebra and Multivariable Calculus
MATH 290-3	MENU: Linear Algebra and Multivariable Calculus
MATH 291-1	MENU: Intensive Linear Algebra and Multivariable Calculus
MATH 291-2	MENU: Intensive Linear Algebra and Multivariable Calculus
MATH 291-3	MENU: Intensive Linear Algebra and Multivariable Calculus
also	
MATH 310-1	Probability and Stochastic Processes
MATH 310-2	Probability and Stochastic Processes
MATH 310-3	Probability and Stochastic Processes
MATH 311-1	MENU: Probability and Stochastic Processes
MATH 311-2	MENU: Probability and Stochastic Processes
MATH 311-3	MENU: Probability and Stochastic Processes
MATH 325-0	Complex Analysis
MATH 334-0	Linear Algebra: Second Course
MATH 351-0	Fourier Analysis and Boundary Value Problems
MATH 353-0	Qualitative Theory of Differential Equations
MATH 354-0	Chaotic Dynamical Systems
MATH 360-1	MENU: Applied Analysis
MATH 360-2	MENU: Applied Analysis
MATH 368-0	Introduction to Optimization
MATH 381-0	Fourier Analysis and Boundary Value Problems for ISP
MATH 382-0	Complex Analysis for ISP
PHYSICS 330-1	Classical Mech
PHYSICS 330-2	Classical Mechanics
PHYSICS 337-0	Physics of Condensed Matter
PHYSICS 339-1	Quantum Mechanics

PHYSICS 339-2	Quantum Mechanics
PHYSICS 339-3	Particle and Nuclear Physics
PHYSICS 352-0	Introduction to Computational Physics
PHYSICS 357-0	Optics Laboratory
PHYSICS 360-0	Advanced Physics Laboratory
PHYSICS 361-0	Classical Optics and Special Relativity
PHYSICS 371-0	Nonlinear Dynamics and Chaos
STAT 210-0	Introduction to Probability and Statistics
STAT 232-0	Applied Statistics
STAT 301-1	Data Science 1 with R
or STAT 303-1	Data Science 1 with Python
STAT 301-2	Data Science 2 with R
or STAT 303-2	Data Science 2 with Python
STAT 301-3	Data Science 3 with R
or STAT 303-3	Data Science 3 with Python
STAT 302-0	Data Visualization
STAT 320-1	Statistical Theory & Methods 1
STAT 320-2	Statistical Theory & Methods 2
STAT 320-3	Statistical Theory & Methods 3
STAT 328-0	Causal Inference
STAT 342-0	Statistical Data Mining
STAT 344-0	Statistical Computing
STAT 348-0	Applied Multivariate Analysis
STAT 350-0	Regression Analysis
STAT 352-0	Nonparametric Statistical Methods
STAT 354-0	Time Series Modeling
STAT 356-0	Hierarchical Linear Models
STAT 383-0	Probability and Statistics for ISP

Human Behavior and Cognition (any 4 units, at least 2 of which must be 300-level or above)

Course	Title
300-level NEUROSCI courses listed under Neuroscience Group A Electives above are eligible if not being used as a Group A course.	
COG_SCI 207-0	Introduction to Cognitive Modeling
COG_SCI 211-0	Learning, Representation & Reasoning
PSYCH 205-0	Research Methods in Psychology
PSYCH 303-0	Psychopathology
PSYCH 336-0	Consciousness
PSYCH 370-0	Cognitive Development
PSYCH 372-0	Language and Cognition
PSYCH 374-0	Human Memory
PSYCH 378-0	Images of Cognition
PSYCH 392-0	Advanced Seminar in Psychology (With the approval of the director of undergraduate studies)

Language and Human Communication (any 4 units, at least 2 of which must be 300-level or above)

Course	Title
CSD 301-0	Anatomy and Physiology of the Vocal Mechanism
CSD 302-0	Anatomy and Physiology of the Peripheral Hearing Mechanism
CSD 305-0	Phonetics
CSD 306-0	Psychoacoustics
LING 250-0	Sound Patterns in Human Language
LING 260-0	Formal Analysis of Words & Sentences
LING 270-0	Meaning
LING 315-0	Experimental Approaches to Word Form Processing
LING 316-0	Experimental Syntax
LING 317-0	Experimental Pragmatics
LING 321-0	Bilingualism
LING 330-0	Research Methods in Linguistics
LING 334-0	Introduction to Computational Linguistics
LING 342-0	Structure of Various Languages
LING 350-0	Fundamentals of Laboratory Phonology
LING 360-0	Fundamentals of Syntax
LING 370-0	Fundamentals of Meaning
LING 371-0	Reference
LING 372-0	Pragmatics
LING 373-0	Implicature

Laboratory Experience, choose one option below (units depend on option selected):

Two units of graded credit from 398 or 399 Undergraduate Research in a relevant field:

Course	Title
NEUROSCI 399-0	Independent Study in Neuroscience (multiple registrations)
NEUROSCI 398-0	Senior Thesis Seminar (With approval of the director of undergraduate studies)
Two units of Undergraduate Research (typically numbered 398 or 399) in another relevant field may satisfy this requirement with the approval of the director of undergraduate studies.	
Two units of approved 398 or 399 Undergraduate Research may be used in place of one unit of credit in an Allied Field.	

One unit of 200-level or higher credit from laboratory or methods undergraduate coursework:

Course	Title
Some courses on this list may double-count for an Allied Field or Neuroscience Elective.	
NEUROSCI 350-0	Advanced Neurophysiology Laboratory
NEUROSCI 355-0	Neurogenetics of Behavior Laboratory
NEUROSCI 357-0	Neuroanatomy Laboratory
PSYCH 205-0	Research Methods in Psychology
BIOL_SCI 232-0	Molecular and Cellular Processes Laboratory (0.34 units)
BIOL_SCI 233-0	Genetics and Molecular Processes Laboratory (0.34 units)
BIOL_SCI 234-0	Investigative Laboratory (0.34 units)
CHEM 235-1	Organic Chemistry Lab I (0.34 units)
CHEM 235-2	Organic Chemistry Lab II (0.34 units)
CHEM 235-3	Organic Chemistry Lab III (0.34 units)
CHEM 237-1	Accelerated Organic Chemistry Laboratory I
CHEM 237-2	Accelerated Organic Chemistry Laboratory II
Other courses with the approval of the director of undergraduate studies.	

Related Courses Required for the Major in Neuroscience:

1 Biology course:

Course	Title
BIOL_SCI 201-0	Molecular Biology

Calculus sequence chosen from:

Course	Title
MATH 220-1	Single-Variable Differential Calculus
MATH 220-2	Single-Variable Integral Calculus
or	

MATH 218-1	Single-Variable Calculus with Precalculus
MATH 218-2	Single-Variable Calculus with Precalculus
MATH 218-3	Single-Variable Calculus with Precalculus
Other with approval of the director of undergraduate studies	

Chemistry sequence chosen from:

Course	Title
CHEM 110-0	Quantitative Problem Solving in Chemistry
CHEM 131-0	Fundamentals of Chemistry I
CHEM 141-0	Fundamentals of Chemistry Laboratory I (0.34 units)
CHEM 132-0	Fundamentals of Chemistry II
CHEM 142-0	Fundamentals of Chemistry Laboratory II (0.34 units)
or	
CHEM 151-0	General Chemistry I
CHEM 161-0	General Chemistry Laboratory I (0.34 units)
CHEM 152-0	General Chemistry II
CHEM 162-0	General Chemistry Laboratory II (0.34 units)
or	
CHEM 171-0	Advanced General Inorganic Chemistry
CHEM 181-0	Advanced General Inorganic Chemistry Laboratory (0.34 units)
CHEM 172-0	Advanced General Physical Chemistry
CHEM 182-0	Advanced General Physical Chemistry Laboratory (0.34 units)

1 Computer Programming course chosen from:

Course	Title
COMP_SCI 110-0	Introduction to Computer Programming
COMP_SCI 111-0	Fundamentals of Computer Programming
ES_APPM 375-1	Quantitative Biology I: Experiments, Data, Models, and Analysis
ES_APPM 375-1 may be used to fulfill either the Statistics or the Computer Programming requirement, but not both.	

With approval of the director of undergraduate studies, either BIOL_SCI 323-0 or ES_APPM 370-1 may count in place of a Computer Programming related course for the Neuroscience major, instead of as a Neuroscience Elective or Allied Field course. Other courses with the approval of the director of undergraduate studies.

Physics sequence chosen from:

Course	Title
PHYSICS 130-1	College Physics
PHYSICS 136-1	General Physics Laboratory (0.34 units)
PHYSICS 130-2	College Physics
PHYSICS 136-2	General Physics Laboratory (0.34 units)
PHYSICS 130-3	College Physics
PHYSICS 136-3	General Physics Laboratory (0.34 units)
or	
PHYSICS 135-1	General Physics
PHYSICS 136-1	General Physics Laboratory (0.34 units)
PHYSICS 135-2	General Physics
PHYSICS 136-2	General Physics Laboratory (0.34 units)
PHYSICS 135-3	General Physics
PHYSICS 136-3	General Physics Laboratory (0.34 units)
or	
PHYSICS 140-1	Fundamentals of Physics
PHYSICS 136-1	General Physics Laboratory (0.34 units)
PHYSICS 140-2	Fundamentals of Physics
PHYSICS 136-2	General Physics Laboratory (0.34 units)
PHYSICS 140-3	Fundamentals of Physics
PHYSICS 136-3	General Physics Laboratory (0.34 units)
or for ISP students	
PHYSICS 125-1	General Physics ISP
PHYSICS 126-1	Physics Laboratory for ISP (0.34 units)
PHYSICS 125-2	General Physics for ISP
PHYSICS 126-2	Physics Laboratory for ISP (0.34 units)
PHYSICS 125-3	General Physics for ISP
PHYSICS 126-3	Physics Laboratory for ISP (0.34 units)

1 Statistics course chosen from:

Course	Title
CSD 304-0	Statistics in Communication Sciences and Disorders
IEMS 201-0	Introduction to Statistics
PSYCH 201-0	Statistical Methods in Psychology
STAT 202-0	Introduction to Statistics and Data Science
STAT 210-0	Introduction to Probability and Statistics
STAT 383-0	Probability and Statistics for ISP
ES_APPM 375-1	Quantitative Biology I: Experiments, Data, Models, and Analysis
ES_APPM 375-1 may be used to fulfill either the Statistics or the Computer Programming requirement, but not both.	
Other courses with the approval of the director of undergraduate studies.	

Honors in Neuroscience

Majors with strong academic records and significant research accomplishments may pursue honors in neuroscience. Interested students should contact the director of undergraduate studies by email no later than the beginning of fall quarter senior year. Considerations for honors include GPA and the quality of a written thesis based on the student's research. Students also must complete at least 1 quarter of NEUROSCI 399-0 Independent Study in Neuroscience and NEUROSCI 398-0 Senior Thesis Seminar in winter of senior year. Students meeting department requirements may be recommended to the college for graduation with honors. For more information consult the department website (https://www.neurobiology.northwestern.edu/undergraduate/honors-in-the-major/) and see Honors in the Major (https://catalogs.northwestern.edu/undergraduate/arts-sciences/#academicoptionstext).