BACHELOR OF SCIENCE (BS) DEGREE WITH A MAJOR IN NEUROSCIENCE AND A MAJOR CONCENTRATION IN COMPUTATIONAL NEUROSCIENCE

Program Learning Outcomes for the BS Degree with a Major in Neuroscience and a Major Concentration in Computational Neuroscience

Upon completing the BS degree with a major in Neuroscience, students will be able to:

1. Demonstrate knowledge of the biological basis for brain and neuron function and the experimental strategies that led to our current understanding.
2. Understand proper experimental design in neuroscience, including how to apply the modern scientific methods, statistics and the most common experimental methods to measure and manipulate brain activity.
3. Demonstrate the ability to communicate effectively to both a scientific and lay audience.
4. Search through, review and evaluate the scientific literature on neuroscience and related fields.

Additionally, upon completing the BS degree with a major in Neuroscience *and a major concentration in Computational Neuroscience*, students will be able to:

1. Demonstrate an advanced ability to analyze quantitatively, model, and interpret neuro-scientific data.

Requirements for the BS Degree with a Major in Neuroscience and a Major Concentration in Computational Neuroscience

For general university requirements, see Graduation Requirements (https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/). Students pursuing the BS degree with a major in Neuroscience and a major concentration in Computational Neuroscience must complete:

- A minimum of 27-30 courses (73-77 credit hours), depending on course selection, to satisfy major requirements.
- A minimum of 120 credit hours to satisfy degree requirements.
- A minimum of 29 credit hours taken at the 300-level or above.
- A maximum of 2 courses (6 credit hours) from study abroad or transfer credit ***after*** matriculation at Rice may be applied towards specific major requirements. For additional program guidelines regarding transfer credit, see the Policies (p. 3) tab.
- The requirements of a major concentration. When students declare the major (https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/#text) in Neuroscience, students must additionally identify and declare one of two major concentrations, either in:
    - Computational Neuroscience (p. 1), ***or***
    - Molecular and Cellular Neuroscience (https://ga.rice.edu/programs-study/departments-programs/natural-sciences/neuroscience/molecular-cellular-neuroscience-bs/#requirementstext).

Because of the common core requirements, it is possible for students to change their major concentration at any time, even after initially declaring the major. To do so, please contact the Office of the Registrar (%20registrar@rice.edu).

The Bachelor of Science (BS) Core Requirements emphasize a broad foundational knowledge of neuroscience. The major concentrations provide an in-depth exposure to various subfields.

The courses listed below satisfy the requirements for this major. In certain instances, courses not on this official list may be substituted upon approval of the major's academic advisor, or where applicable, the department's Director of Undergraduate Studies. (Course substitutions must be formally applied and entered into Degree Works by the major's Official Certifier (https://registrar.rice.edu/facstaff/degreeworks/officialcertifier/).) Students and their academic advisors should identify and clearly document the courses to be taken.

Summary

Code	Title	Credit Hours
Total Credit Hours Required for the Major in Neuroscience and a Major Concentration in Computational Neuroscience		73-77
Total Credit Hours Required for the BS Degree with a Major in Neuroscience and a Major Concentration in Computational Neuroscience		120

Degree Requirements

Code	Title	Credit Hours
Core Requirements		
Non-Neuroscience Courses		
BIOS 201	INTRODUCTORY BIOLOGY I	3
CHEM 121	GENERAL CHEMISTRY I	3
or CHEM 111	AP/OTH CREDIT IN GENERAL CHEMISTRY I	
CHEM 123	GENERAL CHEMISTRY LABORATORY I	1
or CHEM 113	AP/OTH CREDIT IN GENERAL CHEMISTRY LAB I	
MATH 101	SINGLE VARIABLE CALCULUS I [1]	3
or MATH 105	AP/OTH CREDIT IN CALCULUS I	
MATH 102	SINGLE VARIABLE CALCULUS II	3
or MATH 106	AP/OTH CREDIT IN CALCULUS II	
PHYS 125	GENERAL PHYSICS (WITH LAB) [2]	4
PHYS 126	GENERAL PHYSICS II (WITH LAB) [3]	4
PSYC 203	INTRODUCTION TO COGNITIVE PSYCHOLOGY	3
Core Programming Experience Course		
CMOR 220	INTRODUCTION TO ENGINEERING COMPUTATION	3

or COMP 140	COMPUTATIONAL THINKING	
Core Statistics Course		
Select 1 course from the following:		*3-4*
STAT 305	INTRODUCTION TO STATISTICS FOR BIOSCIENCES	
STAT 310 / ECON 307	PROBABILITY AND STATISTICS	
STAT 315	PROBABILITY AND STATISTICS FOR DATA SCIENCE	
Core Neuroscience Lecture Courses		
BIOS 385	CELLULAR AND MOLECULAR MECHANISMS OF THE NEURON	3
NEUR 362 / PSYC 362	COGNITIVE NEUROSCIENCE: EXPLORING THE LIVING BRAIN	3
NEUR 380	FUNDAMENTAL NEUROSCIENCE SYSTEMS	3
NEUR 383 / BIOE 380 / ELEC 380	INTRODUCTION TO NEUROENGINEERING: MEASURING AND MANIPULATING NEURAL ACTIVITY	3
Core Neuroscience Laboratory Courses		
BIOS 212	INTERMEDIATE EXPERIMENTAL CELLULAR AND MOLECULAR NEUROSCIENCE	2
NEUR 310	INDEPENDENT RESEARCH FOR NEUROSCIENCE UNDERGRADUATES [4]	1-4
Core Laboratory Elective		
Select 1 course from the following:		*1-3*
BIOS 315	EXPERIMENTAL PHYSIOLOGY	
BIOS 417	EXPERIMENTAL CELL AND MOLECULAR NEUROSCIENCE	
PSYC 366	METHODS IN SOCIAL COGNITIVE AND AFFECTIVE NEUROSCIENCE	
PSYC 487	FUNCTIONAL HUMAN NEUROANATOMY	

Code	Title	Credit Hours
Major Concentration in Computational Neuroscience		
Lecture Courses		
ELEC 240	FUNDAMENTALS OF ELECTRICAL ENGINEERING I LABORATORY	1
ELEC 241	FUNDAMENTALS OF ELECTRICAL ENGINEERING I	3
MATH 211	ORDINARY DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	3
MATH 355	LINEAR ALGEBRA [5]	3
NEUR 415 / CMOR 415 / ELEC 488	THEORETICAL NEUROSCIENCE: FROM CELLS TO LEARNING SYSTEMS	3
NEUR 416 / CMOR 416 / ELEC 489	NEURAL COMPUTATION	3
Elective Requirements		
Select 2 courses from the following:		*6*
BIOE 492	SENSORY NEUROENGINEERING	
BIOS 128	BRAINSTEM - TEACHING STEM THROUGH NEUROSCIENCE [6]	
BIOS 321	ANIMAL BEHAVIOR	
BIOS 442	MOLECULES, MEMORY AND MODEL ANIMALS: METHODS IN BEHAVIORAL NEUROSCIENCE [7]	
BIOS 443	DEVELOPMENTAL NEUROBIOLOGY [7]	
BIOS 449	ADVANCED CELL AND MOLECULAR NEUROSCIENCE [7]	
CMOR 404	GRAPH THEORY	
CMOR 420	COMPUTATIONAL SCIENCE	
COMP 440 / ELEC 440	ARTIFICIAL INTELLIGENCE	
ELEC 242	SIGNALS, SYSTEMS, AND TRANSFORMS	
ELEC 301	SIGNALS, SYSTEMS, AND LEARNING	
ELEC 303	RANDOM SIGNALS IN ELECTRICAL ENGINEERING SYSTEMS	
ELEC 378	MACHINE LEARNING: CONCEPTS AND TECHNIQUES	
ELEC 475	LEARNING FROM SENSOR DATA	
NEUR 310	INDEPENDENT RESEARCH FOR NEUROSCIENCE UNDERGRADUATES [4]	
PHIL 130	THE SCIENCES OF THE MIND	
PHIL 231	ANIMAL MINDS	
PHIL 431	ADVANCED TOPICS IN THE SCIENCES OF THE MIND	
PSYC 308	MEMORY	
PSYC 310	PSYCHOLOGY OF AGING	
PSYC 354	INTRODUCTION TO SOCIAL AND AFFECTIVE NEUROSCIENCE	
PSYC 430	COMPUTATIONAL MODELING OF COGNITIVE PROCESSES	
Capstone Requirement [7]		
Select one course from the following:		*3*
BIOS 442	MOLECULES, MEMORY AND MODEL ANIMALS: METHODS IN BEHAVIORAL NEUROSCIENCE	
BIOS 443	DEVELOPMENTAL NEUROBIOLOGY	
BIOS 449	ADVANCED CELL AND MOLECULAR NEUROSCIENCE	
Total Credit Hours Required for the Major in Neuroscience and Major Concentration in Computational Neuroscience		**73-77**
Additional Credit Hours to Complete Degree Requirements *		12-16
University Graduation Requirements (https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/) *		31
Total Credit Hours		**120**

Footnotes and Additional Information

* **Note:** University Graduation Requirements include 31 credit hours, comprised of Distribution Requirements (Groups I, II, and III), FWIS, and LPAP coursework. In some instances, courses satisfying FWIS or distribution requirements may additionally meet other requirements, such as the Analyzing Diversity (AD) requirement, or some of the student's declared major, minor, or certificate requirements. Additional Credit Hours to Complete Degree Requirements include general electives, coursework completed as upper-level, residency (hours taken at Rice), and/or any other additional academic program requirements.

[1] MATH 111 and MATH 112 may be substituted for MATH 101 or MATH 105.

[2] PHYS 101 **and** PHYS 103 ***or*** PHYS 111 may be substituted for PHYS 125. The Neuroscience program has determined that credit awarded for PHYS 141 *CONCEPTS IN PHYSICS I* is not eligible for meeting the requirements of the Neuroscience major.

[3] PHYS 102 **and** PHYS 104 ***or*** PHYS 112 may be substituted for PHYS 126. The Neuroscience program has determined that credit awarded for PHYS 142 *CONCEPTS IN PHYSICS II* is not eligible for meeting the requirements of the Neuroscience major.

[4] NEUR 310 *INDEPENDENT RESEARCH FOR NEUROSCIENCE UNDERGRADUATES* may be taken twice for credit to fulfill major requirements. Additional semesters of the course will not fulfill major requirements. The first instance of the course may fulfill the Core Neuroscience Laboratory requirement. The second instance of the course may fulfill the Elective Requirement. In order to fulfill major requirements, NEUR 310 must be taken for either 3 credit hours or 4 credit hours. Credit hours of NEUR 310 cannot be transferred between semesters.

[5] MATH 354 may be substituted for MATH 355.

[6] BIOS 128 *BRAINSTEM - TEACHING STEM THROUGH NEUROSCIENCE* is a 1 credit hour course. It must be taken at least 3 times (for 3 total credit hours) in order to fulfill Elective Requirements.

[7] The Capstone Requirement is **in addition** to the Elective Requirements. The same course may not be used to satisfy more than one requirement for this major and/or major concentration.

Policies for the BS Degree with a Major in Neuroscience and a Major Concentration in Computational Neuroscience

Program Restrictions and Exclusions

Students pursuing the BS Degree with a Major in Neuroscience should be aware of the following program restrictions:

- As noted in Majors, Minors, and Certificates (https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/), under *Declaring Majors, Minors and Certificates*, students may not obtain both a BA and a BS in the same major. Students pursuing the BS Degree with a Major in Neuroscience may not additionally pursue the BA Degree with a Major in Neuroscience.
- Students pursuing the major in Neuroscience may pursue only one major concentration within the major.
- As noted in Majors, Minors, and Certificates (https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/), students may not major and minor in the same subject.

Transfer Credit

For Rice University's policy regarding transfer credit, see Transfer Credit (https://ga.rice.edu/undergraduate-students/academic-policies-procedures/transfer-credit/). Some departments and programs have additional restrictions on transfer credit. The Office of Academic Advising maintains the university's official list of transfer credit advisors (https://oaa.rice.edu/advising-network/transfer-credit-advisors/) on their website: https://oaa.rice.edu. Students are encouraged to meet with their academic program's transfer credit advisor when considering transfer credit possibilities.

Program Transfer Credit Guidelines

Students pursuing the major in Neuroscience should be aware of the following program transfer credit guidelines:

- No more than 2 courses (6 credit hours) of transfer credit from U.S. or international universities of similar standing as Rice may apply towards specific major requirements ***after*** matriculation at Rice.
- Requests for transfer credit will be considered by the program director (and/or the program's official transfer credit advisor) on an individual case-by-case basis.

Additional Information

For additional information, please see the Neuroscience website: https://neuroscience.rice.edu/.

Opportunities for the BS Degree with a Major in Neuroscience and a Major Concentration in Computational Neuroscience

Academic Honors

The university recognizes academic excellence achieved over an undergraduate's academic history at Rice. For information on university honors, please see Latin Honors (https://ga.rice.edu/undergraduate-students/honors-distinctions/university/) (*summa cum laude*, *magna cum laude*, and *cum laude*) and Distinction in Research and Creative Work (https://ga.rice.edu/undergraduate-students/honors-distinctions/university/). Some departments have department-specific Honors awards or designations.

Research in Neuroscience

Research is highly encouraged for all neuroscience programs, and many opportunities are available for independent research at Rice and other institutions of the Texas Medical Center. Students can receive course credit for independent research through the course NEUR 310.

Please Note: Students pursuing the major in Neuroscience may repeat NEUR 310 for credit once as an elective for the major. The first instance of the course may fulfill the Core Neuroscience Laboratory requirement. The second instance of the course may fulfill the Elective Requirement.

Additional Information

For additional information, please see the Neuroscience website: https://neuroscience.rice.edu/.