

# COMPUTATIONAL AND SYSTEMS NEUROSCIENCE MAJOR

## Program Curriculum

Code	Title	Credits
<b>Degree Core Requirements</b>		
CHEM 1035	General Chemistry <sup>1</sup>	3
CHEM 1036	General Chemistry <sup>1</sup>	3
NEUR 1004	Neuroscience Orientation Seminar <sup>1</sup>	2
NEUR 2025	Introduction to Neuroscience <sup>1,2</sup>	3
NEUR 2026	Introduction to Neuroscience <sup>1,2</sup>	3
NEUR 2035	Neuroscience Laboratory <sup>1</sup>	1
NEUR 2036	Neuroscience Laboratory <sup>1</sup>	1
NEUR 4044	Neuroscience Senior Seminar <sup>1,2</sup>	3
PSYC 1004	Introductory Psychology <sup>1,3</sup>	3
Subtotal		22
<b>Major Requirements</b>		
BIOL 1115	Principles of Biology Laboratory <sup>1</sup>	1
BIOL 1116	Principles of Biology Laboratory <sup>1</sup>	1
CS 1114	Introduction to Software Design	3
NEUR 3044	Cellular and Molecular Neuroscience <sup>2</sup>	3
NEUR 3084	Cognitive Neuroscience <sup>2</sup>	3
NEUR 3844	Computational Neuroscience and Neural Engineering <sup>2</sup>	3
NEUR 3234	The Artificial Brain <sup>2</sup>	3
PHYS 2305	Foundations of Physics <sup>2</sup>	4
PHYS 2306	Foundations of Physics <sup>2</sup>	4
STAT 3616	Biological Statistics	3
Subtotal		28
<b>Restricted Electives</b>		
Select two of the following: <sup>4,5</sup>		6
NEUR 2554	Experimental Neuroscience <sup>2</sup>	
NEUR 2594	Exploring Clinical Neuroscience <sup>2</sup>	
NEUR 3054	Brain-Body Interactions in Health and Disease <sup>2</sup>	
NEUR 3074	Evolutionary Neuroscience <sup>2</sup>	
NEUR 3144	Mechanisms of Learning and Memory <sup>2</sup>	
NEUR 3554	Neuroscience Research and Practical Experience <sup>2</sup>	
NEUR 3594	Neurobiology of Psychiatric Disorders <sup>2</sup>	
NEUR 3774	Neuroendocrinology <sup>2</sup>	
NEUR 3914	Neuroscience of Drug Addiction <sup>2</sup>	
NEUR 3944	War and the Brain <sup>2</sup>	
NEUR 4034	Diseases of the Nervous System <sup>2</sup>	
NEUR 4054	Developmental Neuroscience <sup>2</sup>	
NEUR 4064	Neuropharmacology <sup>2</sup>	
NEUR 4314	Genetics in Neuroscience <sup>2</sup>	
NEUR 4364	Neuroscience of Language and Communication Disorders <sup>2</sup>	
NEUR/ECON/PSYC 4454	Neuroeconomics <sup>2</sup>	

NEUR 4514	Neuroimmunology in Health and Disease <sup>2</sup>	
NEUR 4594	Clinical Neuroscience in Practice <sup>2</sup>	
NEUR 4814	Nutritional Neuroscience <sup>2</sup>	
NEUR 4914	Drug Development in Neuroscience <sup>2</sup>	
NEUR 4994	Undergraduate Research (may only be taken after one term of NEUR 2994)	
Select one of the following: <sup>4</sup>		3
ALS 2304	Comparative Animal Physiology and Anatomy <sup>2</sup>	
ALS 4554	Neurochemical Regulation <sup>2</sup>	
BCHM 2024	Concepts of Biochemistry <sup>2</sup>	
BCHM 3114	Biochemistry for Biotechnology and the Life Sciences <sup>2</sup>	
BIOL 2004	Genetics <sup>2</sup>	
BIOL 2134	Cell Function and Differentiation <sup>2</sup>	
BIOL 3404	Introductory Animal Physiology <sup>2</sup>	
BIOL 4824	Bioinformatics Methods <sup>2</sup>	
BMSP 2135	Human Anatomy & Physiology <sup>2</sup>	
BMSP 2136	Human Anatomy and Physiology <sup>2</sup>	
CHEM 1045	General Chemistry Laboratory	
CHEM 1046	General Chemistry Laboratory	
CHEM 2514	Survey of Organic Chemistry <sup>2</sup>	
CHEM 2535	Organic Chemistry <sup>2</sup>	
CHEM 2536	Organic Chemistry <sup>2</sup>	
CHEM 2545	Organic Chemistry Laboratory <sup>2</sup>	
CHEM 2546	Organic Chemistry Laboratory <sup>2</sup>	
CHEM 4554	Drug Chemistry <sup>2</sup>	
CHEM 4615	Physical Chemistry for the Life Sciences <sup>2</sup>	
CHEM 4616	Physical Chemistry for the Life Sciences <sup>2</sup>	
NEUR 2464	Neuroscience and Society	
NEUR 2554	Experimental Neuroscience <sup>2</sup>	
NEUR 2594	Exploring Clinical Neuroscience <sup>2</sup>	
NEUR 3034	Global Perspectives Pre-Departure <sup>2</sup>	
NEUR 3054	Brain-Body Interactions in Health and Disease <sup>2</sup>	
NEUR 3074	Evolutionary Neuroscience <sup>2</sup>	
NEUR 3144	Mechanisms of Learning and Memory <sup>2</sup>	
NEUR 3554	Neuroscience Research and Practical Experience <sup>2</sup>	
NEUR 3594	Neurobiology of Psychiatric Disorders <sup>2</sup>	
NEUR 3774	Neuroendocrinology <sup>2</sup>	
NEUR 3914	Neuroscience of Drug Addiction <sup>2</sup>	
NEUR 3944	War and the Brain	
NEUR 4034	Diseases of the Nervous System <sup>2</sup>	
NEUR 4054	Developmental Neuroscience <sup>2</sup>	
NEUR 4064	Neuropharmacology <sup>2</sup>	
NEUR 4314	Genetics in Neuroscience <sup>2</sup>	
NEUR 4364	Neuroscience of Language and Communication Disorders <sup>2</sup>	
NEUR/ECON/ PSYC 4454	Neuroeconomics <sup>2</sup>	
NEUR 4514	Neuroimmunology in Health and Disease <sup>2</sup>	
NEUR 4594	Clinical Neuroscience in Practice <sup>2</sup>	
NEUR 4814	Nutritional Neuroscience <sup>2</sup>	
NEUR 4914	Drug Development in Neuroscience <sup>2</sup>	

NEUR 4994	Undergraduate Research (may only be taken after two terms of research at the 2994 level)	
PHYS 2504	Math Methods in Physics <sup>2</sup>	
PHYS 3314	Intermediate Laboratory <sup>2</sup>	
PHYS 3405	Intermediate Electricity and Magnetism <sup>2</sup>	
PHYS 3406	Intermediate Electricity and Magnetism <sup>2</sup>	
PHYS 3704	Thermal Physics <sup>2</sup>	
PHYS 4714	Introduction to Biophysics <sup>2</sup>	
PSYC 2044	Psychology of Learning <sup>2</sup>	
PSYC 2064	Introduction to Neuroscience of Behavior <sup>2</sup>	
PSYC 4044	Advanced Learning <sup>2</sup>	
PSYC 4114	Cognitive Psychology <sup>2</sup>	
PSYC 4064	Physiological Psychology <sup>2</sup>	
PSYC 4074	Sensation and Perception <sup>2</sup>	
STAT 4204	Experimental Designs <sup>2</sup>	
Subtotal		9
<b>Free Electives</b>		
Select remaining credits of free electives		14
Subtotal		14
<b>Pathways to General Education</b>		
<i>Pathways Concept 1 - Discourse</i>		
Select six credits in Pathway 1f ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G01F">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G01F</a> )		6
Select three credits in Pathway 1a ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G01A">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G01A</a> )		3
<i>Pathways Concept 2 - Critical Thinking in the Humanities</i>		
Select six credits in Pathway 2 ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02</a> )		6
<i>Pathways Concept 3 - Reasoning in the Social Sciences</i>		
Select six credits in Pathway 3 ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03</a> )		6
<i>Pathways Concept 4 - Reasoning in the Natural Sciences</i>		
BIOL 1105 Principles of Biology <sup>1</sup>		3
BIOL 1106 Principles of Biology <sup>1</sup>		3
<i>Pathways Concept 5 - Quantitative and Computational Thinking</i>		
MATH 1225 Calculus of a Single Variable (5F) <sup>1</sup>		4
MATH 1226 Calculus of a Single Variable (5F) <sup>1</sup>		4
STAT 3615 Biological Statistics (5A) <sup>1</sup>		3
<i>Pathways Concept 6 - Critique and Practice in Design and the Arts</i>		
Select three credits in Pathway 6a ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06A">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06A</a> )		3
Select three credits in Pathway 6d ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06D">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06D</a> )		3
<i>Pathways Concept 7 - Critical Analysis of Identity and Equity in the United States</i>		
Select three credits in Pathway 7 ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G07">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G07</a> )		3
Subtotal		47
<b>Total Credits</b>		<b>120</b>

<sup>1</sup> **Grade Requirements:** Students must earn a grade of "C-" or better in all core neuroscience coursework (CHEM 1035 General Chemistry, CHEM 1036 General Chemistry, NEUR 1004 Neuroscience Orientation Seminar, NEUR 2025 Introduction to

Neuroscience, NEUR 2026 Introduction to Neuroscience, NEUR 2035 Neuroscience Laboratory, NEUR 2036 Neuroscience Laboratory, NEUR 4044 Neuroscience Senior Seminar, PSYC 1004 Introductory Psychology) or the equivalent coursework. Students must also earn a "C-" or better in BIOL 1105 Principles of Biology, BIOL 1106 Principles of Biology, BIOL 1115 Principles of Biology Laboratory, BIOL 1116 Principles of Biology Laboratory, MATH 1225 Calculus of a Single Variable, and MATH 1226 Calculus of a Single Variable.

<sup>2</sup> **Prerequisites:** This check sheet contains courses that have at least one prerequisite that may not be included as part of this degree. Please see your advisor or consult the Undergraduate Course Catalog for more information.

<sup>3</sup> Because PSYC 1004 Introductory Psychology is in the "Core" requirements, it *may not* double count as a concept 3 course.

<sup>4</sup> Courses may not double count with the credits chosen for any other CSNU requirement.

<sup>5</sup> If NEUR 4994 Undergraduate Research is selected, research must total to 3 credits.

## Grade Requirements and Progress Toward Degree Policy

Students must earn a grade of C- or better in the following neuroscience courses within 3 attempts: BIOL 1105 Principles of Biology, BIOL 1106 Principles of Biology, BIOL 1115 Principles of Biology Laboratory, BIOL 1116 Principles of Biology Laboratory, CHEM 1035 General Chemistry, CHEM 1036 General Chemistry MATH 1225 Calculus of a Single Variable or MATH 1226 Calculus of a Single Variable, NEUR 1004 Neuroscience Orientation Seminar, NEUR 2025 Introduction to Neuroscience, NEUR 2026 Introduction to Neuroscience, NEUR 2035 Neuroscience Laboratory, NEUR 2036 Neuroscience Laboratory, NEUR 4044 Neuroscience Senior Seminar, PSYC 1004 Introductory Psychology.

NEUR 1004 can be satisfied with any First-Year Experience course taken at Virginia Tech.

If you have transferred in any of the courses listed above with a C or better, or have equivalent AP/IB/CLEP credit, you have met the minimum grade requirement.

A withdrawal (W) counts as an attempt.

If these requirements are not met, you will be asked to leave the School of Neuroscience.

## Graduation Requirements

### Graduation Requirements

Student must complete a minimum of 120 credit hours with an overall GPA of 2.0 and a minimum in-major GPA of 2.0. For purposes of GPA computation, courses **in-major** will include Core requirements, Major requirements, Restricted Electives, BIOL 1105 Principles of Biology, BIOL 1106 Principles of Biology, BIOL 1115 Principles of Biology Laboratory, BIOL 1116 Principles of Biology Laboratory, and MATH 1225 Calculus of a Single Variable and MATH 1226 Calculus of a Single Variable.

### Double Majors/Minors

The School of Neuroscience offers majors in Cognitive and Behavioral Neuroscience, Clinical Neuroscience, Computational and Systems

Neuroscience, and Experimental Neuroscience. Courses for these majors overlap slightly. Therefore, students may not pursue multiple majors within the School.

## Prerequisites

This check sheet contains courses that have at least one prerequisite that may not be included as part of this degree. Please see your advisor or consult the Undergraduate Course Catalog for more information.

## Terminology

**Pathways Requirements:** Pathways to General Education is defined by the university as “A vibrant, flexible, and innovative general education program that provides a coherent and meaningful learning experience and allows students to integrate the learning for use throughout their lifetimes.”

**Core Neuroscience Requirements:** Core neuroscience requirements are those requirements that must be fulfilled by all students in the School of Neuroscience, regardless of major.

**Major Requirements:** Major requirements are those requirements that are unique to the CSNU major and do not apply across all School of Neuroscience majors.

**Restricted Elective:** Restricted elective courses provide students the autonomy to select 9 or more credits of coursework within an approved list to count towards the students’ degree requirements. These courses expand on the depth and breadth of the CSNU major.

**Free Elective:** Free elective credits may consist of any credit-bearing Virginia Tech coursework to ensure that students reach the 120 credits required by the university to earn a bachelor’s degree. Coursework that does not apply elsewhere towards the degree will apply here (this includes non-duplicative coursework for double majors, minors, or AP coursework that does not count elsewhere towards the degree).

## Acceptable Substitutions

### Acceptable Substitutions

- CHEM 1035 General Chemistry-CHEM 1036 General Chemistry: CHEM 1055 General Chemistry for Chemistry Majors-CHEM 1056 General Chemistry for Chemistry Majors
- CHEM 1045 General Chemistry Laboratory-CHEM 1046 General Chemistry Laboratory: CHEM 1065 General Chemistry for Chemistry Majors Lab-CHEM 1066 General Chemistry for Chemistry Majors Lab
- CHEM 2535 Organic Chemistry- CHEM 2536 Organic Chemistry: CHEM 2565 Principles of Organic Chemistry-CHEM 2566 Principles of Organic Chemistry
- CHEM 2545 Organic Chemistry Laboratory- CHEM 2546 Organic Chemistry Laboratory: CHEM 2555 Organic Synthesis and Techniques Lab- CHEM 2556 Organic Synthesis and Techniques Lab
- CS 1114 Introduction to Software Design: CS 1064 Introduction to Programming in Python-CS 2064 Intermediate Programming in Python
- NEUR 1004 Neuroscience Orientation Seminar: Any approved FYE course
- STAT 3615 Biological Statistics-STAT 3616 Biological Statistics: STAT 3005 Statistical Methods-STAT 3006 Statistical Methods or CMDA 2005 Integrated Quantitative Sciences-CMDA 2006 Integrated Quantitative Sciences

## Foreign Language Requirement

### Foreign Language Requirement

Students who did not successfully complete at least two years of a single foreign, classical, or sign language during high school must successfully complete six semester hours of a single foreign, classical, or sign language at the college level. Courses taken to meet this requirement do not count toward the hours required for graduation. Please consult the Undergraduate Catalog for details.