

Computational Neuroscience BS

MAJOR REQUIREMENTS

- A grade of C- or higher is required for all major coursework.
- Computational Neuroscience BS total units = 67-69 units

NEUROSCIENCE CORE REQUIREMENTS (24 units)

Course Number	Course Name	Units
BISC 220L or 221L	General Biology: Cell Biology and Physiology; Advanced General Biology	4
CHEM 103L/105aL/115aL	Gen. Chemistry for Env. And Life; Gen. Chemistry; Adv. Gen. Chemistry (<i>placement exam or AP credit required</i>)	4
MATH 125	Calculus I (<i>placement exam or AP credit required</i>)	4
MATH 126	Calculus II (<i>MATH 125</i>)	4
PHYS 135aL/151L	Physics for Life Science; Fundamental of Physics I: Mechanics and Thermodynamics (<i>MATH 125</i>)	4
PHYS 135bL/152L	Physics for Life Science; Fundamental of Physics II: Electricity and Magnetism (<i>PHYS 135aL</i>)	4

STATISTICS REQUIREMENT (4 units)

Course Number	Course Name	Units
PSYC 274L	Statistics	4
BISC 305/QBIO 305	Introduction to Statistics for Biologists	4
HP 340L	Health Behavior Statistical Methods	4
MATH 208x	Elementary Probability and Statistics (<i>MATH 125</i>)	4
MATH 307	Statistical Inference and Data Analysis (<i>MATH 125</i>)	4
MATH 407	Probability Theory (<i>MATH 226</i>)	4

NEUROSCIENCE REQUIREMENTS (9 units)

Course Number	Course Name	Units
NEUR/BISC 199	Neuroscience Colloquium	1
PSYC 100L	Introduction to Psychology	4
BISC 421	Neurobiology (<i>BISC 220L</i>)	4

CHOOSE TWO (8 units)

Course Number	Course Name	Units
BISC 407	Cellular and Molecular Neuroscience	4
BISC 408	Systems Neuroscience: From Synapses to Perception (<i>BISC 421</i>)	4
PSYC 440	Introduction to Cognitive Neuroscience (<i>PSYC 100L</i>)	4

BASIC COMPUTATIONAL SKILLS COURSES (2-4 total units)

Course Number	Course Name	Units
BISC 444	Practical Analysis of Data in R	2
ITP 109	Introduction to Java Programming	2
ITP 115	Programming in Python	2
ITP 116	Introduction to Computer Programming for Electrical Engineers	2
ITP 168	Introduction to MATLAB	2
ITP 249	Introduction to Data Analytics	4
CSCI 103L	Introduction to Programming (C/C++)	4
CSCI 455	Intro to Programming System Design (Java/C++)	4
EE 155	Introduction to Computer Programming for Electrical Engineers	4

ADVANCED COMPUTATIONAL COURSES (8 total units)

Course Number	Course Name	Units
BME 210	Biomedical Computer Simulation Methods (<i>coreq. MATH 245</i>)	4
BME 402	Control and Communication in the Nervous System (<i>BME 210 and Math 245; and BISC 110 or 220</i>)	4
BME 425	Basis of Biomedical Imaging (<i>PHYS 152L</i>)	2

BISC 461	Seminar in Molecular and Computational Biology (<i>must be taken with BISC 444</i>)	2
BISC 478	Computational Genome Analysis	4
BISC 481	Structural Bioinformatics: From Atoms to Cells	4
CSCI 360L	Introduction to Artificial Intelligence (<i>CSCI 104L, CSCI 170</i>)	4
CSCI 445L	Introduction to Robotics (<i>CSCI 103L</i>)	4
CSCI 467	Introduction to Machine Learning (<i>CSCI 270, MATH 225, and EE 364 or MATH 407</i>)	4
DSCI 352	Applied Machine Learning and Data Mining (<i>DSCI 250 and Math 208</i>)	4
MATH 308	Statistical Inference and Data Analysis II (<i>MATH 307</i>)	4
PSYC 434	Intelligence, Problem Solving, and Creativity (<i>PSYC 100L, PSYC 274L</i>)	4
PSYC 450	Neural Network Models of Social and Cognitive Processes (<i>PSYC 100L</i>)	4
ITP 449	Applications of Machine Learning (<i>ITP 115 and ITP 249</i>)	4
QBIO 401	Introduction to Computational Analysis of Biological Data	4

BIOLOGICAL AREA (4 total units)

Course Number	Course Name	Units
BISC 424	Brain Architecture (<i>BISC 421</i>)	4
BISC 461	Seminar in Molecular and Computational Biology (<i>may be taken twice</i>)	2
BISC 462	Seminar in Neurobiology (<i>may be taken twice</i>)	2
BISC 481/QBIO 481	Structural Bioinformatics: From Atoms to Cells	4
BISC 490	Directed Research	2-4
HBIO 435	Neurobiology of Feeding Behavior and Obesity (<i>BISC 220L</i>)	4
HP 409	Environmental Impact on the Brain	4
MEDS 330	Bionics: Solutions to Enable the Disabled	2
RXRS 403	Neuropharmacology in Health and Disease (<i>BISC 220L</i>)	4
RXRS 404	Neuroimmunity in Health and Disease	2

BEHAVIORAL AREA (4 total units)

Course Number	Course Name	Units
PSYC 301L	Cognitive Processes (<i>PSYC 100L</i>)	4
PSYC 304L	Sensation and Perception (<i>PSYC 100L</i>)	4
PSYC 326	Behavioral Neuroscience (<i>PSYC 100L</i>)	4
PSYC 420	Animal Behavior (<i>PSYC 100L</i>)	4
PSYC 424	Neuropsychology	4
PSYC 437	Adolescent Development (<i>PSYC 100L</i>)	4
PSYC 425	Functional Imaging of the Human Brain (<i>PSYC 100L; PSYC 274L</i>)	4
PSYC 438	Behavioral Genetics (<i>PSYC 274L</i>)	4
ECON 405	Neuroeconomics (<i>ECON 303</i>)	4
LING 385L	Human Language as Computation	4
MEDS 330	Bionics: Solutions to Enable the Disabled	2

ADDITIONAL COURSE (2-4 total units) Take one additional course from the Computational, Biological, or Behavioral area, or complete four units of Neuroscience research (*NEUR 490*).

Course Number	Course Name	Units
CSCI 170	Discrete Methods in Computer Science (<i>CSCI 102</i>)	4
Math 225	Linear Algebra and Linear Differential Equations (<i>MATH 126 or MATH 127 or MATH 129</i>)	4
Math 226	Calculus III (<i>MATH 126 or MATH 127 or MATH 129</i>)	4
Math 245	Mathematics of Physics and Engineering I (<i>MATH 226 or MATH 227 or MATH 229</i>)	4
NEUR 490x	Directed Research	2-4

AVAILABLE COURSEWORK FOR ADVANCED COMPUTATIONAL COURSE SUBSTITUTION ^

Course Number	Course Name	Units
BISC 406 (<i>fall</i>)	Biotechnology (<i>BISC 320L</i>)	4
BME 202	Control and Communication in the Nervous System (<i>MATH 126 or 129</i>)	4
PSYC/MDA 423	User Experience	4
ITP 365	Managing Data in C++	

ITP 310	Design for User Experience	
---------	----------------------------	--

AVAILABLE COURSEWORK FOR BIOLOGICAL COURSE SUBSTITUTION ^

Course Number	Course Name	Units
RXRS 405	Breaking Brains: The Pharmacology of Addiction	4
BISC 423 (<i>spring</i>)	Epilepsy to Ecstasy: Biological Basis of Neurological Disorders (<i>BISC 421</i>)	4
GERO 414 (<i>spring</i>)	Neurobiology of Aging (<i>BISC 220L or 221L</i>)	4

AVAILABLE COURSEWORK FOR BEHAVIORAL COURSE SUBSTITUTION ^

Course Number	Course Name	Units
RXRS 405	Breaking Brains: The Pharmacology of Addiction	4
PSYC 426	Motivated Behaviors and Addiction (<i>PSYC 100L</i>)	4

GRADUATE-LEVEL COURSEWORK AVAILABLE FOR ADVANCED COURSE SUBSTITUTION #^

Course Number	Course Name	Units
BME 502	Advanced Studies of the Nervous System	4
BME 575L	Computational Neuroengineering (<i>BME 502</i>)	3
CSCI 561	Foundations of Artificial Intelligence	4
CSCI 564	Brain Theory and Artificial Intelligence	3
CSCI 574	Computer Vision	3
CSCI 662	Advanced Language Processing	4
EE 559	Mathematical Pattern Recognition	3
NSCI 524	Advanced Overview of Neurosciences (<i>BISC 421</i>)	4
PSYC 506	Learning and Cognition	4
PSYC 540	Cognitive Neuroscience	4
PSYC 544	Psychophysiology	4
PSYC 545	Neuropsychology	4
PSYC 547	Functional Neuroanatomy	4
PSYC 551	Decision Neuroscience	4
PSYC 555	Intro. to Functional Magnetic Resonance Imaging	4

#Student must have a minimum cumulative GPA of 3.3 and receive permission to enroll from Program Director and course instructor.

Computational Neuroscience BS

This is a **SAMPLE** 4-year course plan.

Each student will work with their advisor to create an individualized course plan.

Semester 1	
Course	Units
CHEM 105aL/115aL/103L [GE E]	4
MATH 125 [GE F]	4
WRIT 150	4
Foreign Language I	4
Elective Course (optional)	1-2
Total Units	16-18

Semester 2	
Course	Units
BISC 220L or 221L [GE D]	4
MATH 126	4
GESM 110, 120, or 130	4
Foreign Language II	4
NEUR 199	1
Total Units	17

Semester 3	
Course	Units
BISC 421 (BISC 220L/221L)	4
PSYC 100L	4
GE A, B, C, G, or H	4
Foreign Language III	4
Elective Course (optional)	1-2
Total Units	16-18

Semester 4	
Course	Units
BISC 407/BISC 408/PSYC 440	4
*Statistics	4
Basic Computational Skills	4
GE A, B, C, G, or H	4
Elective Course (optional)	1-2
Total Units	16-18

Semester 5	
Course	Units
PHYS 135aL (MATH 125)	4
CPNS Behavioral	4
CPNS Prerequisite (if needed)	4
GE A, B, C, G, or H	4
Elective Course (optional)	1-2
Total Units	16-18

Semester 6	
Course	Units
PHYS 135bL (PHYS 135aL)	4
BISC 407/BISC 408/PSYC 440	4
CPNS Prerequisite (if needed)	4
GE A, B, C, G, or H	4
Elective Course (optional)	1-2
Total Units	16-18

Semester 7	
Course	Units
CPNS Computational	4
CPNS Biological	4
WRIT 340	2
GE A, B, C, G, or H	4
Elective Course (optional)	1-2
Total Units	16-18

Semester 8	
Course	Units
CPNS Computational	4
CPNS Additional	4
GE A, B, C, G, or H	4
Elective Course	4
Elective Course (optional)	1-2
Total Units	16

() Denotes Prerequisite Course

[] Denotes GE designation

*Statistics requirement can be fulfilled by taking PSYC 274L, BISC 305, MATH 208x, or MATH 307

Courses highlighted in orange are major requirements

BISC 121L/221L and CHEM 115aL/115bL are reserved for students in Freshman Science Honors