

B.S. in NEUROSCIENCE information session

- Welcome
- The major fields of neuroscience in relation to GT's strengths
- The BS in Neuroscience curriculum
- Majors, minors, second degrees
- Designing your schedule
- How the change of major process will be handled

Molecular neuroscience is a branch of neuroscience that observes concepts in molecular biology applied to the nervous systems of animals. The scope of this subject covers topics such as molecular neuroanatomy, mechanisms of molecular signaling in the nervous system, the effects of genetics and epigenetics on neuronal development, and the molecular basis for neuroplasticity and neurodegenerative diseases

Neurotransmitters

Voltage-gated ion channels (Na^+ , K^+ , Ca^{2+})

Ionotropic receptors (GABA, glutamate, nicotinic Ah)

Metabotropic receptors (G protein)

Neuronal gene expression (Sex differences, epigenetics of the brain)

Molecular mechanisms of neurodegenerative diseases (Alzheimer's, Parkinson's, Huntington's)



Cellular neuroscience is the study of neurons at a cellular level. This includes morphology and physiological properties of single neurons. Several techniques such as intracellular recording, patch-clamp, and voltage-clamp technique, pharmacology, confocal imaging, molecular biology, two photon laser scanning microscopy and Ca^{2+} imaging have been used to study activity at the cellular level. Cellular neuroscience examines the various types of neurons, the functions of different neurons, the influence of neurons upon each other, how neurons work together.

Neurons and glial cells

Neuronal function

Action potential

Structure and formation of synapses

Neurotransmitter transporters, receptors, and signaling mechanisms

Synaptic plasticity

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Systems neuroscience is a subdiscipline of neuroscience and systems biology that studies the function of neural circuits and systems. It is an umbrella term, encompassing a number of areas of study concerned with how nerve cells behave when connected together to form neural networks. At this level of analysis, neuroscientists study how different neural circuits analyze sensory information, form perceptions of the external world, make decisions, and execute movements.

- Auditory system
- Gustatory system
- Motor system
- Olfactory system Reward system
- Sensory system
- Somatosensory system
- Visual system

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Cognitive neuroscience is the scientific field that is concerned with the study of the biological processes and aspects that underlie cognition, with a specific focus on the neural connections in the brain which are involved in mental processes. It addresses the questions of how cognitive activities are affected or controlled by neural circuits in the brain.

Behavioral neuroscience, also known as biological psychology, biopsychology, or psychobiology is the application of the principles of biology to the study of physiological, genetic, and developmental mechanisms of behavior in humans and other animals.

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USG core (63 cr.)

English, Math, Humanities, Social Science, Lab Science, Computing, Health
Incl. PSYC 1101, NEUR 2001

Neuroscience core (12 cr.)

4 required classes

Neuroscience electives (18 cr.)

Research or capstone (4 cr.)

Interest elective: Molec/Cell or Cog/Behav or Systems (3-4 cr.)

Psyc or Biol Statistics elective (3-4 cr.)

Additional NEUR electives (6-8 cr.)

Breadth elective specialization (15 cr. +)

Biology, chemistry, computer science, mathematics, physics, physiology,
psychology;
engineering, pre-health

Free electives

Research option, Business option

Introductory classes that you have likely already taken will transfer

CHEM 1310

CHEM 1315

CHEM 3511

PHYS 2211 (Mod, M+I or LS)

PHYS 2212 (Mod, M+I or LS)

MATH 1551

MATH 1552 (or 1555-LS)

MATH 1553 (or 1554)

CS 1301 or 1315 or 1371

ENGL 1101

ENGL 1102

CHEM 1211K

CHEM 1212K

CHEM 2311

CHEM2312

SocSci – 12 cr.

PSYC 1101 + 9 cr

HUM - 6 cr.

[1] USG/GIT Core (areas A-F + health): 63 cr.

Subject	Course No.	Semester	Year	cr.	grade
<i>Area A:</i>					
ENGL	1101	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	____ 3 ____
ENGL	1102	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	____ 3 ____
MATH 1552 or 1555	_____	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	____ 4 ____
<i>Area B:</i>					
CS 1310,1315 or 1371	_____	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	____ 3 ____
<i>Area C: Humanities electives (6 cr.)</i>					
_____	_____	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	____ ____ ____
_____	_____	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	____ ____ ____
<i>Area D:</i>					
MATH	1551	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	____ 2 ____
MATH	1553	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	____ 2 ____
PHYS	2211K	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	____ 3 ____
PHYS	2212K	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	____ 3 ____

Area E Social Science elective (12 cr.)

PSYC	1101	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	_____	4	_____
_____	_____	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	_____	—	—
_____	_____	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	_____	—	—
_____	_____	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	_____	—	—

Area F

BIOL	1510	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	_____	4	_____
CHEM 1310 (or 1211) ^a	_____	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	_____	4	—
CHEM 1315 (or 1212) ^a	_____	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	_____	3	—
CHEM 3511 (or 2311) ^a	_____	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	_____	3	—
NEUR	2001	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	_____	4	—

Health

APPH	_____	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	_____	2	_____
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^a approved substitution for students completing the pre-health breadth elective.

[2] Major Requirements: 30 cr.

Subject	Course No.	Semester	Year	cr.	grade
<i>Neuroscience Core (12 cr.)</i>					
APPH	4400	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	— 3 —
NEUR	3001	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	— 3 —
PSYC	4020	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	— 3 —
NEUR	3010	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	— 3 —

Options	Check one selection	Semester	Year	cr.	grade
<i>Neuroscience Depth Electives (18 cr.)</i>					
<i>One Research-based Elective (4 cr.)</i>					
NEUR 4001 or NEUR 4699 ^a	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> F	<input type="checkbox"/> Sp	<input type="checkbox"/> Su	— 4 —

NEUR 2001 - Principles of Neuroscience (4cr.)

First semester foundations of neuroscience and behavioral system control.

Pre/co-requisites: BIOL 1510 & PSYC 1101

APPH 4400 - Human Neuroanatomy (3 cr.)

Systems-based study of the anatomy of central and peripheral nervous systems for the control of behavior. *Pre/co-requisites:* None

NEUR 3001 - Cell and Molecular Neuroscience (3 cr.)

Fundamentals of cellular and molecular function of the nervous system.

Pre-requisite: NEUR 2001

NEUR 3010 - Methods in Neuroscience (3 cr.)

Critical methodological review of, and hands-on experience with, traditional and cutting edge techniques to understand neural function in cells, animals and humans. *Pre-requisites:* NEUR 3001; and CS 3001 or CS 1315 or CS 1371; and PHYS 2212.

PSYC 4020 – Biopsychology (3 cr.)

Neurophysiological, endocrinological, and biochemical bases of sensory and motor functioning, motivation, learning, memory, and behavior dysfunction.

Pre-requisites: PSYC 1101; and BIOL 1520 or NEUR 2001.

NEUR 4001 - Neuroscience Research Project Laboratory (4 cr.)

Collaborative seminar focusing on future directions and applications of neuroscience with a collaborative focus.

Pre-requisites: NEUR 3010

or

NEUR 4699 - Undergraduate Research (4 r.)

Independent research under the guidance of a faculty member.

Pre/co-requisites: None

NOTE: NEUR 4699 may only substitute for NEUR 4001 if it is part of the

[Research Option](#).

Options	Check one selection	Semester	Year	cr.	grade
<i>Neuroscience Depth Electives (18 cr.)</i>					
<i>One Research-based Elective (4 cr.)</i>					
NEUR 4001 or NEUR 4699 ^a	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> F <input type="checkbox"/> Sp <input type="checkbox"/> Su	—	4	—
<i>One Interest Elective (3 or 4 cr.)</i>					
BIOL 3450 (3 cr.) and 3451 (1 cr.) or APPH 3755 (3 cr.) and 3756 (1 cr.) or PSYC 4090 (3-0-3)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> F <input type="checkbox"/> Sp <input type="checkbox"/> Su	—	—	—
MATH - Statistics PSYC 2020 (3-3-4) or BIOL 4401 (3-0-3)		<i>Statistics Elective (3 or 4 cr.)</i>			
Subject	Subject and Course No.	Semester	Year	cr.	grade
<i>Additional Neuroscience Electives (6-8 cr.)</i>					
see Appendix 2	_____	<input type="checkbox"/> F <input type="checkbox"/> Sp <input type="checkbox"/> Su	—	—	—
	_____	<input type="checkbox"/> F <input type="checkbox"/> Sp <input type="checkbox"/> Su	—	—	—
	_____	<input type="checkbox"/> F <input type="checkbox"/> Sp <input type="checkbox"/> Su	—	—	—

[3] Breadth Electives (15 cr.) (21 cr. for Pre-health students; 16 cr. for Psychology students)

Completion of a Minor in Biochemistry, Biology, Chemistry, Computer Science, Mathematics, Physics, Physiology or Psychology; or completion of a Pre-health or Engineering “specialization”, see Appendix 3

[4] Free Electives: 14 cr. (exceptions: 7 cr. for Pre-health students; 13 cr. for Psychology students)

Majors, minors and second degrees

Major classes that you have already taken will likely transfer into the 15 cr. Breadth Elective Specialization

Current Major → Minor CoS, CoC - Yes (BME?)

NEURO minor? No

Current Major → Second Major Yes
discuss with both major advisors

A second degree

13.F.3. To obtain a second undergraduate degree, a student must complete all major required courses for the degree and earn credit for a total of at least 36 credit hours in excess of the requirement for any previous degrees earned.

Complete the NEUR degree using as many classes as possible that may also be applied to the other degree:

- most of core areas A-E
- some of core area F
- statistics elective (3-4 cr. BIOL or PSYC)
- interest elective (3-4 cr. BIOL or PSYC)
- additional Neuro electives (6-8 cr.)
- breadth elective specialization (15 cr.)
 - apply this to second major, rather than to a minor

Determine what other classes you need in the other degree.

You might need additional courses (as free electives) to have a total of >158 cr.

Many advisors recommend a major + minor, and moving on; rather than adding a year to get the second degree.

A modified schedule for continuing students

You need to take these classes on this schedule

	FALL	SPRING
17-18 AY	APPH 4400 PSYC 1101 BIOL 1510	NEUR 2001
18-19 AY	NEUR 3001 PSYC 4020	NEUR 3010
19-20 AY	NEUR 4001 ^a (or Sp)	

^a Research Option replaces NEUR 4001

In 17-18 AY, continue with CHEM, PHYS, MATH sequences:

CHEM 1310, 1315, 3511
or

CHEM 1211K, 1212K, 2311, 2312

PHYS 2211, 2212

MATH 1551, 1552 (or 1555), 1553 (or 1554)

APPH 1040/1050
ENGL 1101, 1102

CS
Soc Sci.
Hum.

Over these six semesters, you also need to complete:

- Neuro interest elective (1 class)
- Neuro additional electives (2-3 classes)
- Neuro statistics elective (1 class)
- Breadth electives (5+ classes)
- Free electives

- Sign up at www.cos.gatech.edu/neuroscience
- “Change your major to neuroscience” link
- students signed-up by midnight Friday: invitations on Monday.
- Students sign up later: invitations issued on each following Monday.
- The invitation is to complete the change of major process by submitting the Change-of-Major form *within 4 weeks*. This must be signed by an advisor in the current major. Submit the signed form to Ashley Edwards (Cherry Emerson 307) **with a Course Check List (from the website) completed with past, present, and future classes.**
- *DegreeWorks* modules for this new program for this are not yet available.