

# MOLECULAR AND CELLULAR NEUROSCIENCE (BS)

The B.S. in Molecular/Cellular Neuroscience focuses on the genetic, biochemical, and electrophysiological underpinnings of the development, function, plasticity, pathology, and repair of the nervous system.

Our neuroscience majors are designed to provide both breadth and depth to the neuroscience knowledge base of our students, and afford ample opportunities for developing creative and critical thinking skills needed to advance neuroscience (or any other life science field).

## Curriculum

Code	Title	Hours
<b>Basic Science and Math Foundations</b>		
PSYC 101	General Psychology	3
BIOL 101	General Biology I	3
BIOL 111	General Biology I Lab	1
BIOL 102	General Biology II	3
BIOL 112	General Biology II Lab	1
Select one of the following three sets of classes:		4
CHEM 101 & CHEM 111	General Chemistry A Lecture/Discussion and General Chemistry Lab A	
CHEM 160 & CHEM 161	Chemical Structure and Properties and Chemical Structure and Properties Laboratory	
CHEM 105	Chemical Principles	
Select one of the following three sets of classes:		4
CHEM 102 & CHEM 112	General Chemistry B Lecture/Discussion and General Chemistry Lab B	
CHEM 180 & CHEM 181	Chemical Reactivity I and Chemical Reactivity I Lab	
CHEM 106	Basic Inorganic Chemistry	
BIOL 251	Cell Biology	3
BIOL 282	Genetics	3
BIOL 252	Cell Biology Laboratory	1
or BIOL 283	Genetics Laboratory	
MATH 131	Applied Calculus I	3
or MATH 161	Calculus I	
Select one of the following three sets of classes:		4
PHYS 111 & 111L	College Physics I Lec / Dis and College Physics Laboratory I	
PHYS 121 & PHYS 111L	College Physics I Lec/Dis and College Physics Laboratory I	
PHYS 125 & 125L	General Physics I Lec/Dis and General Physics Laboratory I	
Select one of the following three sets of classes:		4
PHYS 112 & 112L	College Physics II Lec/Disc and College Physics Lab II	
PHYS 122 & PHYS 112L	College Physics II Lec/Dis and College Physics Lab II	
PHYS 126 & 126L & 126F	General Physics II Lec/Dis and General Physics Laboratory II and Freshman Projects	

BIOL 335 / STAT 335	Intro to Biostatistics	3
or PSYC 304	Statistics	

Neuroscience Foundations Courses		
NEUR 101	Introduction to Neuroscience	3
BIOL 362	Neurobiology	3
PSYC 382 / BIOL 284	Behavioral and Cognitive Neuroscience	3

Molecular/Cellular Neuroscience Track		
<b>Molecular/Cellular Neuroscience Specialty Area Courses</b>		
One additional year of Chemistry lectures is required:		6-8

CHEM 221 & CHEM 222	Organic Chemistry I Lec/Disc and Organic Chemistry II Lec/Disc	
CHEM 223 & CHEM 224	Organic Chemistry A Lec/Disc and Organic Chemistry B Lec/Disc	
CHEM 240 & CHEM 260	Chemical Reactivity II and Quantitative Methods in Chemistry	

Molecular/Cellular Neuroscience Lecture Electives		
Select three of the following:		9

NEUR 300	Seminar in Neuroscience	
PSYC 240 / BIOL 240	Psychology-Biology of Perception	
BIOL 307	Biology of Stem Cells	
BIOL 351	Sleep/Circadian Rhythms	
BIOL 352	Neurobiology of Feeding in Health and Disease	
BIOL 357	Neural Disease, Degeneration, and Regeneration	
BIOL 358	Developmental Neurobiology	
CHEM 361 & BIOL 366	Principles of Biochemistry and Cell Physiology & Biochemistry	
or CHEM 370	Biochemistry I	
BIOL 381	Epigenetics	
BIOL 382	Molecular Genetics	
BIOL 395	Special Topics in Biology (Special Topics in Biology, Cellular and Gross Functional Neuroanatomy, other 395's do not count)	
COMP 386	Computational Neuroscience	
PSYC 378	Drugs and Behavior	

Molecular/Cellular Neuroscience Lab Electives		
Select two of the following:		3-8

BIOL 283	Genetics Laboratory	
or BIOL 252	Cell Biology Laboratory	
NEUR 301 / BIOL 373 / PSYC 388	Laboratory in Neuroscience I	
BIOL 313 / PSYC 311	Lab in Psychobiology	
or PSYC 316	Lab in Experimental Psychology: Sense & Perception	
BIOL 315	Introductory Immunology Lec/Lab	
BIOL 366L	Cell Physiology & Biochemistry Lab	
or CHEM 372	Biochemistry Laboratory I	
BIOL 367	Bioimaging	
BIOL 390	Molecular Biology Laboratory	
BIOL 395L	Special Topics Laboratory (If offered: Bacterial Genomics, other 395's do not count)	

May include one of the following independent research options: 1-6

BIOL 396	Research	
BIOL 398	Internship in Biology	
CHEM 300	Undergraduate Research	
<b>Molecular/Cellular Neuroscience Capstone</b>		
BIOL 376	Seminar in Molecular/Cellular Neuroscience	3
or BIOL 358	Developmental Neurobiology	

**Total Hours** 71-83

## Undergraduate Research

Neuroscience students have numerous opportunities to conduct scientific research in the labs of our neuroscience-affiliated faculty at Loyola's Lake Shore Campus (<https://www.luc.edu/neuroscience/aboutus/facultydirectoryandresearch/#den422313>), in the labs of other faculty on any of Loyola's campuses, or at other institutions in the Chicago area. Depending on the applicability of the research project to the student's Neuroscience Major or Minor, independent research may be able to qualify for course credit as one of the required specialty labs (see below).

## Molecular/Cellular Neuroscience Majors Research Credit

Molecular/Cellular Neuroscience (NRMC) majors can earn specialty lab credit for conducting **independent research that has a molecular/cellular focus** in labs within the biology department or at an appropriate external internship site. Please see the Specialty lab credit for independent research–NRMC document on the Neuroscience program website (<https://www.luc.edu/neuroscience/undergraduateresearch/>) for a more thorough explanation of earning NRMC credit through one of the 3-credit courses below:

- BIOL 396 Research (relevant research with faculty in Biology)
- BIOL 398 Internship in Biology (relevant research at an external site)

Please contact the NRMC Director for questions about earning credit from molecular/cellular or neuroscience-related research in other departments (e.g., chemistry, psychology).

## Course Objectives

Because the nervous system is the organ for behavior, neuroscience cuts across traditional fields in the biological and behavioral sciences. Owing to this breadth, we have designed two major tracks for students who wish to focus on neuroscience in their course of study at LUC. Completing either of these options will prepare students well for a variety of careers, including but not limited to medicine and life sciences research, particularly in neuroscience-related fields. Both options require at least two semesters of courses in biology, chemistry, and physics.

## Lecture Course Objectives

Both of the majors require three courses in neuroscience fundamentals: NEUR 101 (<https://catalog.luc.edu/search/?P=NEUR%20101>) Introduction to Neuroscience, BIOL 362 (<https://catalog.luc.edu/search/?P=BIOL%20362>) Neurobiology (which stresses cellular and electrophysiological mechanisms of neural function), and PSYC 382 (<https://catalog.luc.edu/search/?P=PSYC%20382>)/BIOL 284 (<https://catalog.luc.edu/search/?P=BIOL%20284>) Behavioral and Cognitive Neuroscience (which stresses the neural substrates underlying mental processing and behavior). After completing this sequence, majors

can design their own course of study within cognitive/behavioral or molecular/cellular neuroscience. There is some overlap in the list of lecture courses from which students may choose to complete their elective requirements, but there is also great diversity in the topics that are available in each major track.

## Lab Course Objectives

Aside from first-year labs in chemistry and biology, and organic chemistry lab for molecular/cellular neuroscience majors, neuroscience majors choose their own lab experiences. Because the nervous system is cellular, computational, and a control center, the range of techniques that are useful is extremely broad, from cellular/molecular to behavioral, and the student can decide which techniques will be most helpful in answering the questions they want to address. Students who are interested in conducting independent neuroscience research have several neuroscience labs from which to choose, and may also seek permission to carry out a neuroscience-relevant project in a lab that is not focused on neuroscience. Independent research is the best preparation for doctoral programs, and is also regarded highly by medical, dental and other life science professional schools. For this reason, getting an independent research position in a lab is competitive.

## Seminar Courses

There are three seminar style courses available to neuroscience undergraduates. In these courses, students tackle the primary literature and react to seminars given by neuroscientists on their research.

Molecular/Cellular Neuroscience majors are invited to take the 1 credit hour NEUR 300 (<https://catalog.luc.edu/search/?P=NEUR%20300>) Seminar in Neuroscience course, providing basic exposure to the primary literature and a wide range of research talks. Both major tracks culminate with a required capstone seminar class, which immerses the students in the primary literature and encourages development of critical thinking and presentation skills.

## College of Arts and Sciences Graduation Requirements

All Undergraduate students in the College of Arts and Sciences are required to take two Writing Intensive courses (6 credit hours) as well as complete a foreign language requirement at 102-level or higher (3 credit hours) or a language competency test. More information can be found here (<https://www.luc.edu/cas/college-requirements/>).

## Additional Undergraduate Graduation Requirements

All Undergraduate students are required to complete the University Core, at least one Engaged Learning course, and UNIV 101. SCPS students are not required to take UNIV 101. Nursing students in the Accelerated BSN program are not required to take core or UNIV 101. You can find more information in the University Requirements (<https://catalog.luc.edu/undergraduate/university-requirements/>) area.