Neuroscience Major Requirements    FALL 2017 or Later

Undergraduate Program in Neuroscience
_headers: 1140 Undergrad. Science Bldg. (USB)  :  http://www.lsa.umich.edu/neurosci
_headers: lsa-biology-advising@umich.edu  :  734-763-7984 (front desk)

Why study Neuroscience?
Neuroscience is the study of the nervous system. Neuroscientists aim to understand how the nervous system develops and functions on a cellular level as well as the mechanisms that underlie behavior, mental disorders and disease. The faculty teaching courses in the major include cellular and molecular neuroscientists appointed in the Department of Molecular, Cellular and Developmental Biology (MCDB) and behavioral and cognitive neuroscientists appointed in the Department of Psychology. This interdisciplinary program gives students the best of both of these worlds.

Who should major in Neuroscience?
Any student who wishes to pursue a career studying the nervous system or behavior. This is an excellent major for anyone interested in pre-health careers, graduate studies, or careers in the biotech industry.

Exclusions:
Students who elect a major in Neuroscience may not elect the following majors: Biology; General Biology; Cell and Molecular Biology (CMB and CMB:BME); Biopsychology, Cognition and Neuroscience (BCN); Brain, Behavior, and Cognitive Sciences (BBCS); Biochemistry; Biomolecular Science (BMS); Plant Biology; or Microbiology; nor elect a minor in Biology, Plant Biology, Chemistry, or Biochemistry.

Students can double major in Psychology and Neuroscience or Cognitive Science and Neuroscience, but may only share a maximum of 3 courses toward their two programs.

How do I declare?
Students interested in neuroscience are encouraged to meet with an advisor to discuss their academic plans as soon as possible! Students need not have completed all of the prerequisites of the major to declare, but should usually have completed the biology introductory sequence with a 2.0 or better and be in good academic standing. Make an advising appointment online through the Neuroscience website: www.lsa.umich.edu/neurosci.

What courses should I take first?
Students with AP Biology credit (Biology 195) should take the Introductory Biology Lab (BIOLOGY 173) during their first year. Transfer students who receive credit for BIOLOGY 191 should take BIOLOGY 192 and BIOLOGY 173 to complete the introductory biology sequence. All other students should begin the introductory biology sequence during their first year and complete it no later than their second year. BIOLOGY 171 and 172/174 can be taken in either order. Students should take BIOLOGY 173 when they enroll in their second semester of introductory biology.

| BIOLOGY 171 | BIOLOGY 172 or 174  
| (prerequisite: prior or concurrent credit for CHEM 130) |
| ...focuses on ecology, biodiversity, and genetics and evolutionary processes. Students engage with biological hypotheses dealing with prominent current issues such as human evolutionary origins, emerging diseases, conservation biology, and global change. | ...focuses on how cells, organs, and organisms work. (174 covers the same material as 172 but is geared toward students who prefer a more problem-solving approach to understand biology, rather than a more traditional lecture-based course.) |

| BIOLOGY 173  
| (prerequisite = BIOLOGY 171, 172, 174, 191, or 195) |
| ...is the accompanying lab component to the introductory sequence. The course provides an integrated introduction to experimental biology. Topics focus on biochemistry, molecular genetics, evolution, and ecology. |

Can I transfer courses from another institution?
Yes, students will work with the applicable department for the transferring subject to have your course evaluated (i.e., the Psychology department for PSYCH classes) and with the transferring institution to issue your official transcript to UM. Check the Undergraduate Program in Neuroscience website for more detailed instructions. http://www.lsa.umich.edu/neurosci/academics/advisingprogram/policies/transfercredit_ci

What can I do with my Neuroscience undergraduate degree?
The undergraduate degree in neuroscience is a great starting point for graduate programs in neuroscience, psychology, or biology. The degree will also prepare students for medical, dental, veterinary or pharmacy school. Other possible jobs are in health services, industry, government, teaching, and sales. http://www.lsa.umich.edu/neurosci/careers
How do I get involved in research?
Determine what you may be interested in through your introductory courses and search the faculty directory of both MCDB and Psychology. All faculty will have their research interest listed in the directory. When contacting faculty to sponsor you for an independent study course or undergraduate research assistant position, we recommend that you treat it as if it were a professional job interview. It is expected that you have done some background research on the faculty, their publications and current research projects. Explain how you will be an asset to the lab, and how this experience will help you as you develop your career path. Provide a resume with examples of leadership, self-motivation, and dedication to work tasks. Contact faculty early if you plan to register for course credit. Students interested in research should plan to spend at least two semesters working in a lab. Research is an asset to Psychology graduate admission applications (and often the most important component of the application). http://www.lsa.umich.edu/neurosci/studentresearch

Scholarships for research are also available. http://www.lsa.umich.edu/neurosci/academics/awardsscholarships

What are the requirements for Honors?
The Neuroscience B.S. degree is the basis for the Honors degree in Neuroscience. Students must elect two terms of independent research (under PSYCH 424 & 426 for those with Psychology mentors, MCDB 300/400 for those with MCDB mentors), maintain an overall and major GPA of 3.4, complete an Honors thesis, and give a research presentation based on their Honors work.

Undergraduate research for an honors concentration in neuroscience must be completed on a topic in neuroscience that is approved by the major steering committee. If students are uncertain if their research topic fits this requirement they may contact the chair of the neuroscience major steering committee for guidance.

Prior to applying to the Neuroscience Honors Program students must identify a research mentor in the Department of Psychology or MCDB. See the list of possible mentors in the Undergraduate Program in Neuroscience office. (Students may conduct Honors research with faculty in other units on the University of Michigan campus, but must have a formal co-sponsor relationship with an approved neuroscience faculty member in Psychology or MCDB.)

Students apply to the Honors Program in Neuroscience by submitting a Neuroscience Honors Application (http://www.lsa.umich.edu/biology/academics/honorsprogram) with a research proposal. Neuroscience honors applications are due no later than the end of the add/drop period one semester prior to graduation (i.e. approximately Sep 25 for students graduating at the end of Winter term, and approximately January 25 for students graduating at the end of the Fall term or Summer term). When special circumstances apply, the honors committee may accept an application beyond the normal due date. Upon approval by the chair of the Neuroscience Steering Committee students are declared into the Honors plan. Honors theses must be submitted by December 1, April 1, or August 1 of the term of graduation. http://www.lsa.umich.edu/neurosci/academics/honorsprogram

How do I find out about internships, study abroad, or summer programs?
Information about study abroad, faculty-led intercultural internships, faculty-led courses and field experiences, and Spring/Summer language study is available through the Center for Global and Intercultural Study. Please refer to www.lsa.umich.edu/cgis for detailed information about options.

LSA also offers many programs. https://www.lsa.umich.edu/summer/summerprograms

Related Student Groups:
Neuroscience Students Association (NSA)
The NSA is a student organization for students interested in neuroscience. This organization provides networking opportunities, seminars, and exposure to the depth of neuroscience. The organization also aims to actively participate in service to its community and provide the public with information on neuroscience, health, and general science topics. They hope to broaden their horizons of members by exposing them to medicine, public health, research, and engineering. The organization hopes to expose students to the many facets of this broad, advancing field. Email: NeuroscienceStudentAssociation@umich.edu.

Biology Student Alliance (BSA)
The BSA is a student organization intended for Neuroscience, CMB, Biology, Plant Biology, Microbiology and Biochemistry concentrators. BSA provides opportunities for undergraduates to enhance their learning in the natural sciences and gain exposure to various careers in scientific research and health-related fields. BSA aims to foster scientific discussion and stimulate innovative thinking in biology, seeks to build and sustain meaningful relationships among like-minded peers, and offer informal tutoring, academic advising, community service events, and coordinate events with various faculty guest speakers to help introduce undergraduates to various research fields. In addition, the BSA provides a space for students to present their own research in a low-pressure environment and give participants constructive feedback to help acquire skills that will be applicable to their current and future academic/professional careers. Email: BSA-Board@umich.edu
Quantitative Prerequisite (Elect two courses)
MATH 115, 120, 185 (or equivalent) Calculus I
MATH 116, 121, 156, 176, and 186 (or equivalent) Calculus II
PHYSICS 125, 135, 139, 140, 160 General Physics I (or Honors)
PHYSICS 126, 235, 239, 240, 260 General Physics II (or Honors)
EECS 183 (4) Elementary Programming Concepts
With permission of a neuroscience advisor, other courses that help
students develop quantitative skills can be substituted, or a sixth upper
level elective can substitute for the 2nd quantitative prerequisite.

NEUROSCIENCE UPPER LEVEL ELECTIVES – 4 Classes (1-2 from Group A; 2-3 from Group B; 0-1 from Group C)

Group A: Molecular and Cellular Neuroscience (Elect at least one course)
- MCDB 303 (3) Biological Rhythms
- MCDB 402 (3) Molecular Biology of Pain and Sensation
- MCDB 403 (3) Molecular and Cell Biology of the Synapse
- MCDB 418 (3) Endocrinology
- MCDB 421 (3) Topics in Cellular & Molecular Neurobiology
- MCDB 422 (3) Brain Development, Plasticity and Circuits
- MCDB 426 (3) Molecular Endocrinology
- MCDB 450 (3) Genetics and Molec. Bio. of Complex Behavior
- MCDB 453 (3) Ion Channels
- MCDB 455 (3) Cell Biology of Neurodegeneration
- MCDB 456 (3) Genes, Circuits, and Behavior
- MCDB 458 (3) Neuroepigenetics
- MCDB 459 (3) Brain States and Behavior
- HUMGEN 480 (3) Neurodevel Disorders

Group B: Behavioral & Cognitive Neuroscience (Elect at least two courses)
- PSYCH 240 (4) Introduction to Cognitive Psychology
- PSYCH 330 (2-4) Topics in Biopsychology
- PSYCH 332 (3) Biopsychology of Rhythms & Behavior
- PSYCH 333 (3) Affective Neuroscience
- PSYCH 334 (3) Neuroscience of Learning & Memory
- PSYCH 336 (3) Drugs of Abuse, Brain, and Behavior
- PSYCH 337 (3) Hormones and Behavior
- PSYCH 345 (4) Introduction to Human Neuropsychology
- PSYCH 430 (3) Special Topics in Biopsych.
- PSYCH 431 (2-4) Special Topics in Behav. Neurosci.
- PSYCH 343 (3) Neurosci. of Fear & Anxiety
- PSYCH 435 (3) Neuro. of Attention and Attentional Disorders
- PSYCH 454 (3) Developmental Neuroscience
- PSYCH 442 (3) Cog Neurosci of Expertise
- PSYCH 531 (3) Advanced Topics in Biopsychology
- PSYCH 532/ANATOMY 541/ PHYSIOL 541 (4) Mammalian Reproductive Physiology
- NEUROL 455 (3) Neurobiology of Parkinson Disease
- NEUROSCI 470 (4) Neuroanatomy

Group C: Additional Courses on topics highly relevant to some types of Neuroscience (Elect no more than 1 course.)
- BIO 205 (3) Developmental Biology
- BIO 207 (4) Microbiology
- EEB 492 (4) Behavioral Ecology (BIOSTATION: 5 credits)
- MCDB 397/EEB 397 (3) Writing in Biology (ULWR)
- MCDB 401 (3) Advanced Topics
- MCDB 405 (3) Molecular Basis of Development
- MCDB 411 (3) Protein Structure and Function
- MCDB 416 (3) Introduction to Bioinformatics
- MCDB 417 (3) Chromosome Structure and Function
- MCDB 427 (4) Molecular Biology
- MCDB 428 (4) Cell Biology
- MCDB 435 (3) Intracellular Trafficking
- MCDB 436 (3) Immunology
- MCDB 440 (3) Cell Cycle Control
- MCDB 441 (3) Cell Biology and Disease
- MCDB 454 (3) Cytoskeletal Dynamics
- MCDB 462 (3) Epigenetics
- PSYCH 338/ANTHRBIO 368 (4) Primate Social Behavior I (ULWR)
- PSYCH 346 (3) Learning and Memory
- PSYCH 414/WOMENSTD 452 (3) Sexuality and Science
- PSYCH 420 (must be taken for 3 credits to count) Faculty-Directed Advanced Tutorial Reading for Psych as a Nat Sci
- PSYCH 441 (3) Neuroscience & Society
- PSYCH 448 (3) Mathematical Psychology
- BIOLCHEM 640 (2) Regulatory RNA & Control of Gene Expression
- PHRMACOL 310 (4) Pharmacology and Therapeutics
- Other courses may be approved by a concentration advisor as suitable for group C. Most frequently these are upper level courses in statistics, mathematics or from a basic science department of the medical school.

Group D: Laboratory Requirement (Elect at least two courses, with at least one being from D1, for a min. of 4 cred. total)

Group D1: Method-based laboratory courses (Elect at least one course.)
- BIO 226 (2) Animal Physiology Laboratory
- MCDB 306 (3) Introductory Genetics Laboratory
- MCDB 423 (3) Cellular and Molecular Neurobiology Laboratory
- MCDB 424 (2) Behavior Neurobiology Laboratory
- MCDB 429 (3) Cellular and Molecular Biology Laboratory
- PSYCH 302 (3) Research Methods in Cognitive Neuroscience (ULWR)
- PSYCH 331 (4) Labs in Biopsychology (ULWR)

Group D2: Research-based laboratory courses
- MCDB 300/400 (2 - 3) Undergraduate Research*
- PSYCH 326 (2 - 4) Research for Psychology as a Natural Science
- PSYCH 422 (3) Adv. Research for Psych. as a Natural Science
- PSYCH 424 (3) Honors Research I for Psych. as a Nat. Science**
- PSYCH 426 (3) Honors Research II for Psych. as a Nat. Sci.**
- PSYCH 428 (2-4) Senior Thesis

*Max. of 3 cr. of ind. research may count toward the major. Must be taken for a min. of 2 cr. and be completed in a single term.
**Required for Neuroscience Honors with Psychology mentor
**NEUROSCIENCE MAJOR REQUIREMENTS**

### NEUROSCIENCE PREREQUISITES:

#### Introductory Biology Sequence:

<table>
<thead>
<tr>
<th>TERM</th>
<th>COURSE</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ Complete Sequence A, B, or C:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A: BIO 171, 172 or 174, &amp; 173</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B: BIO 195 (AP) &amp; 173</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C: BIO 191 (transfer credit), 192, &amp; 173</td>
<td></td>
</tr>
</tbody>
</table>

#### Chemistry Sequence:

<table>
<thead>
<tr>
<th>TERM</th>
<th>COURSE</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ CHEM 210</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ CHEM 211</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ CHEM 215</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ CHEM 216</td>
<td></td>
</tr>
</tbody>
</table>

#### Quantitative Prerequisites

<table>
<thead>
<tr>
<th>TERM</th>
<th>COURSE</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Statistics: STATS 250 or 280</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ 2 courses from list of MATH, PHYSICS, and STATS course options (or with advisor approval one course and a sixth course from the list of upper level electives).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### NEUROSCIENCE MAJOR:

#### Core Courses

<table>
<thead>
<tr>
<th>TERM</th>
<th>COURSE</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Principles of Cellular and Molecular Neuroscience: BIO 222</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Principles of Human and Animal Physiology: BIO 225</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Introduction to Behavioral Neuroscience: PSYCH 230</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Biochemistry: Choose from: MCDB 310, BIOLCHEM 415, or CHEM 351</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Genetics: BIO 305</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Upper Level Electives (4 courses)

<table>
<thead>
<tr>
<th>TERM</th>
<th>COURSE</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ One Course from Molecular &amp; Cellular Neuroscience - Group A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Two Courses from Behavioral &amp; Cognitive Neuroscience - Group B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ One Additional Course - Group A, B, or C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Lab Courses – Group D (2 courses, 4 credits minimum, at least one from D-1)

<table>
<thead>
<tr>
<th>TERM</th>
<th>COURSE</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Method-based laboratory courses – Group D1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Second lab course – Group D1 or D2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Total Units and GPA Requirement for Neuroscience

<table>
<thead>
<tr>
<th>TERM</th>
<th>COURSE</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Minimum 33 cr. in Major (200-level &amp; above) = Core Courses (17-18 cr.) + Electives (min. 12 cr.) + Labs (min. 4 cr.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Minimum 2.0 GPA in Concentration (GPA is calculated from all courses used for major requirements, and all courses in BIOLOGY, MCDB, and Natural Science PSYCHOLOGY courses)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### HONORS STUDENTS ONLY:

<table>
<thead>
<tr>
<th>TERM</th>
<th>COURSE</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Minimum 3.4 Major GPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Minimum 3.4 Cum. GPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Independent Research (2 terms required, more recommended)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSYCHOLOGY focus area: PSYCH 424 &amp; 426</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCDB focus area: MCDB 300 and/or MCDB 400</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>