

MICHIGAN STATE UNIVERSITY

February 22, 2012

MEMORANDUM

TO: Dr. Douglas Estry, Associate Provost for Undergraduate Education
and Dean of Undergraduate Studies

FROM: Dr. Linda O. Stanford, Associate Provost for Academic Services

RE: Request for a New Bachelor of Science Degree in Neuroscience
For Transmittal to the University Committee on Undergraduate Studies
(UCUS)

The request referenced above is being sent to the University Committee on Undergraduate Studies (UCUS) in accordance with the *Bylaws for Academic Governance*, 4.4.

UCUS Response Requested:

Please ask the UCUS to consider the request referenced above and provide consultative commentary. Please mail the related materials referenced under the heading Attachments at the end of this memorandum to the UCUS members.

After receiving UCUS's consultative response, the Provost will make a determination to forward or not to forward the request to the University Committee on Curriculum for its approval of curriculum and degree requirements.

If you have any questions, please call Joy Speas, University Curriculum Administrator, at 5-8420.

Thank you.

Attachments:

1. Request to Establish a New Academic Program form dated January 9, 2012: Bachelor of Science Degree in Neuroscience and attachments.

s:\share\lucusneubs



**University
Curriculum and
Catalog**

176 Administration Bldg.
East Lansing, MI
48824-1046

517-355-8420
Fax: 517-353-1935

View a Program		Main Menu
Joy Speas, RO	Monday, 1/9/2012	
Program Name: Neuroscience Degree: BS Sequence Number: 1	Program Request ID: 2123	
Effective Dates: Fall 2012 - Open Status: Interim Initial Action: New		
Requested Date: 12/5/2011 1:13:31 PM		
<p>1. Department/School/College: 32612 Program in Neuroscience</p> <p>2. Name of Program: Neuroscience</p> <p>3. Name of Degree: BS</p> <p>4. Type of Program: Major</p> <p>5. Effective Start Semester: Fall 2012</p> <p>6. Target student audience for the program: Students requiring broad-based knowledge of structure/function of nervous system</p> <p>7. Enrollment: What is the expected enrollment per year: 100 What is the minimum enrollment acceptable: 25</p> <p>8. Source of budget for the program: To align academic planning and curricular change, ALL requests for NEW funds must be included in the College's annual planning letter. Provost approval of new funds and the effective date for the new program must align. If funding is not approved, then the program request will not be forwarded to Faculty Senate. College reallocation If new funds, was this request included in the College's annual planning letter? Indicate yes or no. If no, then this is a department or college fund reallocation (If the program is implemented, no additional resources are required.). Yes</p> <p>9. Projected Costs as compared to other programs in unit: Same</p> <p>10. Staff requirement: How many additional staff will be required: 7 Who will provide the primary instruction. Describe any external linkages(industry, government, etc.): Neuroscience Program faculty including Drs. Marc Breedlove, James Galligan, Cynthia Jordan, Laura Symonds, and Hongbing Wang. New hires included in the 2010 Planning Document and</p>		

approved with budget allocation to begin in 2011-2012 will assist with teaching as they come on board, as early as spring 2013. Other existing Neuroscience Program faculty will be asked to contribute as needed.

11. Will additional equipment be required:

Approximate cost: 0

Source of funding:

12. Will additional library materials be required:

Approximate cost: 0

Source of funding: none

13. Will additional space be required:

Type:

Approximate amount: new program will utilize space allocated to Neuroscience Program

14. If the program requirements contain a named concentration, do you wish for the concentration to be noted on the student's transcript?:

No

15. Detailed Description:

Recent priorities in biomedical research including those articulated by the National Institutes of Health (NIH) have focused on interdisciplinary approaches to solving problems related to human and animal health. Today's successful investigator must be able to approach problem-solving from a multidisciplinary perspective and work collaboratively with professionals from diverse fields. By its very nature the field of neuroscience is highly interdisciplinary, and cuts across a large number of disciplines, including those within the biological, psychological, engineering, and social sciences.

Neuroscience as a field has experienced exponential growth in the past two decades, reflected for example in the creation of new publication venues and scholarly societies. Naturally the expansion of the field has generated interest in the general public and particularly among undergraduate students who recognize the value of comprehensive training in neuroscience at the undergraduate level.

In light of both the priorities in biomedical research and the growing demand from students, for the past several years faculty in the Neuroscience Graduate Program have been discussing the need to train undergraduates in integrative neuroscience. We recognize that applicants to health professional and biomedical graduate programs with broad training in neuroscience, including critical thinking skills and independent research experience are both more competitive and better prepared to undertake post-university training (Mennerick, 2011). Graduates with neuroscience training are also prepared for a wide array of career directions including research in government and private industry in which analytical thinking and integrative reasoning are highly valued.

The proposed MSU undergraduate program will be truly interdisciplinary, incorporating upper level courses and research opportunities from departments

within the Colleges of Natural Science, Social Science, Arts and Letters, and Osteopathic and Human Medicine. This will be a particular strength of the MSU neuroscience program. In the 2008-2009 academic year, the most recent year for which there are reliable data, there were 110 undergraduate neuroscience programs in the United States, 72 of them at primarily undergraduate institutions (PUIs) (Ramos et al., 2011). Currently although there is increasing attention to neuroscience-based curricular issues among the Big Ten Universities (e.g., the introduction of a concentration in neuroscience at the University of Michigan), there are only *four* neuroscience degree-granting programs (Indiana, Purdue, Ohio State, and Minnesota). Thus the MSU program will be among the few that have the extensive research facilities and the broad expertise of a large faculty that a research intensive university can offer. Also unique among most neuroscience majors or other programs at other institutions, students who major in neuroscience at MSU will have the opportunity to sample broadly across the neuroscience discipline and take courses not often included in neuroscience concentrations, minors, or even majors (e.g., philosophy; cognitive science). This broad interdisciplinary curriculum in neuroscience is designed to further develop students' communication, reasoning and thinking skills as well as their future success.

b. Rationale for offering the program at MSU

Along with the national and international expansion of neuroscience curricula, societies and journals, the MSU Neuroscience Graduate Program and neuroscience-related undergraduate curricula in other units (e.g., Psychology) have experienced similar growth in both courses offered and faculty who teach them and who do neuroscience research, making this a propitious time to introduce an undergraduate major in neuroscience. We anticipate the demand for the major to be high based on the experiences of neuroscience programs recently introduced at other research intensive universities. We also anticipate that the new program will attract the most highly-qualified in-state students. Finally, because the program will be one of the few neuroscience majors offered at a research intensive university, the program will improve the standing of the university by accessing a new pool of highly qualified out-of-state and international students.

c. Rationale for the program being housed in the primary administrative unit

The new undergraduate major in neuroscience will be housed in the interdisciplinary Neuroscience Graduate Program (NSP) in the College of Natural Science. The highly interdisciplinary nature of the neuroscience field itself makes the Neuroscience Program a natural fit. The NSP faculty are committed to teaching the core courses required in the major, and the facilities of the NSP will be used for the laboratory course and administration.

d. Educational objectives of the program and their relationship to those of the

college and the University

The educational objectives of the neuroscience major and their relationship to the university's liberal learning goals are listed in the chart below.

Competency (Knowledge, Attitude, Skill)	Specific (Measurable) Learning Objective(s):	MSU Liberal Learning Goal (s)
Ability to acquire and evaluate information from a variety of sources	1. Perform an effective literature search 2. Critique published peer-reviewed papers 3. Identify limits of knowledge from available data 4. Produce properly formatted reference section in research manuscript	Analytical Thought
Ability to analyze a problem using multiple levels of analysis and across disciplines and sub-disciplines	1. Propose hypotheses and design multiple experiments to test the hypotheses using more than one level of analysis (e.g., cellular; systems) 2. Propose hypotheses and design multiple experiments to test the hypotheses using multiple neuroscience subdisciplines (e.g., molecular biology; cognitive science)	Analytical Thought
Ability to apply appropriate quantitative methods to solve a problem	1. Implement appropriate statistical tests to analyze research projects 2. Understand data analysis section of published research in peer-reviewed neuroscience journals	Analytical Thought
Ability to recognize appropriate use of scientific methods	1. Identify appropriate and inappropriate conclusions in popular press articles that summarize neuroscience research published in peer-reviewed journal	Analytical Thought
Ability to communicate neuroscientific information to diverse audiences	1. Present scientific poster on research conducted (e.g., in lab, at UURAF, at regional or national scientific meeting) 2. Write up experimental findings in style of peer-reviewed neuroscience journal article 3. Present neuroscience information to elementary, middle or high school students 4. Summarize neuroscience information or principles for lay public or legislators	Effective Communication & Effective Citizenship
Ability to integrate neuroscience content across multiple levels	1. Successfully pass exams in the two-semester sequence of neuroscience survey courses	Integrated Reasoning

of analysis to solve problems	2. Demonstrate knowledge of how genes, molecules, and cells all contribute to behavior and cognition in the array of systems studied in the two-semester sequence of neuroscience survey courses	
-------------------------------	--	--

e. Faculty who were instrumental in developing the program and faculty who will be responsible for implementing the program

The initial proposal for an MSU undergraduate neuroscience program was developed by four NSP faculty members, including the most recent director and current director. These four faculty (Drs. Cheryl Sisk, James Galligan, Marc Breedlove and Laura Symonds) are now joined by a standing committee within the governance of the NSP who will be responsible for implementing the program. In addition, NSP faculty members who will teach the core courses within the new program include Drs. Marc Breedlove, James Galligan, Cynthia Jordan, Laura Symonds, and Hongbing Wang. New hires as they come on board will begin to assist with teaching as early as spring 2013.

f. Plan for evaluating the program. Plan for assessing student outcomes. For academic major programs, indicate the learning objective/goals for students and how outcomes will be assessed.

Success in meeting the Learning Objectives and Liberal Learning Goals outlined in 15d will be evaluated for the required core courses: the two semesters of "Introduction to Neuroscience" and the "Neuroscience Laboratory." On the first day of the fall semester course "Introduction to Neuroscience I" students will be administered a pre-test of the content of the course. The same test will be administered before the final exam to assess the extent to which students mastered the content. This same strategy will be applied to the second semester course, "Introduction to Neuroscience II." The assignments and projects in the required laboratory course will be used to identify whether analytical thought and effective communication Liberal Learning Goals were met.

g. Program description including statement and specific requirements of the program as they will appear in the University catalog.

College of Natural Science
 Neuroscience Program
 Undergraduate Programs
 Neuroscience – Bachelor of Science

The Bachelor of Science degree program with a major in neuroscience is for students who

wish to pursue a career in which a broad-based knowledge of the structure and function of the nervous system is necessary, including careers in research, education, healthcare or business. It is also intended for those students who seek admission to graduate programs in neuroscience or health-related professional schools. After fulfilling the core course requirement of the major, students select one of three concentrations in neuroscience: molecular and developmental; behavioral and systems; or cognitive.

Requirements for the Bachelor of Science Degree in Neuroscience

1. The University requirements for bachelor's degrees as described in the *Undergraduate Education* section of this catalog; 120 credits, including general elective credits, are required for the Bachelor of Science degree in Neuroscience.

The University's Tier II writing requirement for the Neuroscience major is met by completing NEU 311L (Neuroscience Laboratory). This course is referenced in 3.i below.

Students who are enrolled in the College of Natural Science may complete the alternative track to Integrative Studies in Biological and Physical Sciences that is described in item 1. under the heading Graduation Requirements in the College statement. Certain courses referenced in requirement 3. below may be used to satisfy the alternative track.

2. The requirements of the College of Natural Science for the Bachelor of Science degree. The credits earned in certain courses referenced in requirement 3. below may be counted toward College requirements as appropriate.

3. The following requirements for the major:

a. One of the following pairs of courses (5 or 6 credits):

(1)	CEM	141	General	4
Chemistry				
I	CEM	161	Chemistry Laboratory	1
(2)	CEM	151	General <i>and</i> Descriptive	4
Chemistry				
I	CEM	161	Chemistry Laboratory	1
(3)	CEM	181H	Honors Chemistry	4
I				
I	CEM	185H	Honors Chemistry Laboratory	2
(4)	LB	171	Principles of Chemistry	4
I				
I	LB	171L	Introductory Chemistry Laboratory	1

b. One of the following pairs (6 credits):

(1)	CEM	251	Organic Chemistry
-----	-----	-----	-------------------

	I			3	
		CEM	252	Organic Chemistry	
II				3	
	(2)	CEM	351	Organic Chemistry	
I				3	
		CEM	352	Organic Chemistry	
II				3	
c. One of the following pairs of courses (6 or 8 credits):					
	(1)	PHY	231	Introductory Physics	
I				3	
		PHY	232	Introductory Physics	
II				3	
	(2)	PHY	183	Physics for Scientists and Engineers	
I		4			
		PHY	184	Physics for Scientists and Engineers	
II		4			
	(3)	PHY	193H	Honors Physics I -	
	Mechanics			3-4	
		PHY	294H	Honors Physics II -	
	Electromagnetism			3-4	
	(4)	LB	271	Physics	
I			273		3-4
		LB	272	Physics	
II			274		3-4
d. One of the following courses (3 or 4 credits):					
	(1) ^e	MTH	124	Survey of	
	Calculus I				3
	(2) ^e	MTH	132	Calculus	
I					3
	(3) ^e	MTH	152H	Honors Calculus	
I					3
	(4) ^e	LB	118	Calculus	
I					4
e. One of the following courses (3 or 4 credits):					
	(1) ^e	STT	201	Statistical	
	Methods				4
	(2) ^e	STT	231	Statistics for	

Scientists 3

I ²⁽³⁾ STT 421 Statistics 3

f. Both of the following courses (⁸ 7 credits):
Psychology PSY 101 Introductory ³⁻⁴
Biochemistry BMB 401 Comprehensive 4

g. One of the following groups of courses (8 or 9 credits):

(1) BS 161 Cell and Molecular Biology 3
Biology
BS 162 Organismal and Population Biology 3
BS 171 Cell and Molecular Biology Laboratory 2

(2) BS 181H Honors Cell and Molecular Biology 3
BS 182H Honors Organismal and Population Biology 3
BS 191H Honors Cell and Molecular Biology Laboratory 2

(3) LB 144 Biology I: Organismal Biology 4
LB 145 Biology II: Cellular and Molecular Biology 5

h. One of the following groups of courses (4 or 6 credits):

(1) PSL 310 Physiology for Pre-Health Professionals 4

I (2) PSL 431 Human Physiology I 3
II PSL 432 Human Physiology II 3

i. All of the following courses (8 credits):
NEU 301 Introductory Neuroscience I

I ^{con to} Introductory Neuroscience II 3 NEU 302 3

Laboratory (w) NEU 311L Neuroscience

(2) Exception to Tier II policy
see policy Tier II

j. One course from each of the following two groups of courses (6 credits):

(1)	PHM 350	Introductory Human	
Pharmacology		3	
	PHM 431	Drug Abuse Pharmacology of Drug Addiction	
		3	
	PHM 480	Special Problems in	
Pharmacology		3	
(2)	MMG 404	Human	
Genetics			3
	MMG 409	Eukaryotic Cell	
Biology		3	

k. One of the following three concentrations (15 credits minimum):

(1) Cellular and Developmental Neuroscience *26 credits*

Genetics	ZOL 341	Fundamental	
		4	
Laboratory	ZOL 343	Genetics	
			3
Neurobiology	ZOL 402		
			3
Development <i>(w)</i>	ZOL 425 <i>(w)</i>	Cells and	
			4
Bioinformatics	BMB 400	Introduction to	
		3	
Genetics	MMG 404	Human	
			3
Biology	MMG 409	Eukaryotic Cell	
		3	
Disease	NEU 420	Neurobiology of	
		3	
Neuroscience	NEU 490	Independent Research in	
	<i>NSC</i>	<i>1-3</i>	<i>Delete per Kathy Doig 2-8-12</i>

Students may not use MMG 404 or MMG 409 for both requirement j(2) and k (1)

(2) Behavioral and Systems Neuroscience

Behavior	PSY 209	Brain and	
			3
Sexuality	PSY 310	Psychology and Biology of Human	
			3
Perception <i>(w)</i>	PSY 402 <i>(w)</i>	Sensation and	
			3
Development <i>(w)</i>	PSY 409 <i>(w)</i>	Psychobiology of Behavioral	
			3
Memory <i>(w)</i>	PSY 410 <i>(w)</i>	Neurobiology of Learning and	
			3
	PSY 411 <i>(w)</i>	Hormones and	

Behavior (w)			3	
Neuroscience (w)	PSY	413(w) ^e		Laboratory in Behavioral
Psychology (w)	PSY	493(w) ^e	3-4	Issues in
Behavior	ZOL	313		Animal 3
Neurobiology	ZOL	403		Integrative 3
	PHM	431		Drug Abuse Pharmacology of Drug Addiction 3
Pharmacology	PHM	480		Special Problems in 1-3
Disease	NEU	420		Neurobiology of 3
Neuroscience	NEU	490		Independent Research in 1-3
<p>Note: Students may not use PHM 431 for j(1) and k(2)</p> <p>(3) Cognitive Neuroscience</p>				
Psychology	PSY	200		Cognitive 3
Behavior	PSY	209		Brain and 3
Neuroscience	PSY	301		Cognitive 3
Skill	PSY	401(w) ^e		Expertise and Memory and Skill (w) 3
Perception (w)	PSY	402(w) ^e		Sensation and 3
Memory (w)	PSY	410(w) ^e	3	Neurobiology of Learning and
Psychology (w)	PSY	493(w) ^e		Issues in 3
the Mind	ENG	492H		Cognitive Science and Literary History of Honors Seminar in English
Philosophy	PHL	200		Introduction to 3
	PHL	462		Philosophy of Mind 3
Methods	PSL	429		Biomedical Imaging 3
Neurolinguistics	LIN	455		3
Science	LIN	463		Introduction to Cognitive 3
Neuroscience	NEU	490		Independent Research in 1-3

h. If the program will be offered in a location other than the main campus in East Lansing, specify the location(s).

Independent research in neuroscience undertaken as part of NEU 490 can be met by performing supervised independent research in the laboratory of any member of the NSP, including those whose laboratories are located on the Grand Rapids campus of the College of Human Medicine.

i. List the name and describe any certificate program that is associated with a new or extant degree program.

N/A

j. Other information that will assist the Provost and the University-level committees in evaluating the request.

A request for resources to support the new major was submitted in April 2011 in the 2011-12 Planning Document as part of a larger request to expand the campus neuroscience research initiative. This included a request for 6 full time tenure stream faculty, a laboratory manager, a level 7 CTU, an undergraduate program director/advisor, and 8 teaching assistants. Five full time faculty positions, 8 teaching assistantships (4 CNS, 4 SSC) the laboratory manager, CTU, and undergraduate advisor positions have all been approved in the 2011-2012 budget.

Mission Statement

The rapid growth of the interdisciplinary field of neuroscience has created an urgent need for college and university graduates who are broadly educated across the separate disciplines integrated within neuroscience. The mission of the undergraduate program in neuroscience at Michigan State University is to provide students with a solid academic foundation in this diverse array of disciplines including biology, physiology, biochemistry, physics, pharmacology, psychology and cognitive science. Coursework and research opportunities integrate multiple levels of analysis in the study of molecules, cells, and circuits that underlie behavior, mental processes, and cognition. The MSU neuroscience program's emphasis on both teaching and research successfully prepares students for graduate and health professional degree programs, and employment in government or industry.

Michigan State University

Assessing Student Outcomes

College: Natural Science
 Department: Neuroscience Program
 Program or Major: Neuroscience
 Program Level: undergraduate
 Contact Person: James Galligan, Ph.D., Director, Neuroscience Program
 Laura Symonds, Ph.D., Director Undergraduate Neuroscience

Inventory of Written Statements and Plans

1. Do you have a written mission statement or statement of purpose? **yes** **no**
If yes, please attach a copy or reference where this can be found:

See 15j above (Other information that will assist the Provost and the University-level committees in evaluating the request.)

2. Do you have a written statement of intended educational outcomes **yes** **no**
 describing what a student should know or be able to do when they have completed this program?
3. Do you have a written method of assessment for measuring student **yes** **no**
 outcomes?
4. Does your program have a separate accreditation process? **yes** **no**
If yes, please list all accrediting agencies below:

Assessment Methodologies

It is likely that some assessment measures are already in place in this program even if they are not identified as being part of a formal assessment plan. Listed below are some of the assessment methodologies you may be using. Indicate **"A"** if the method is currently being used; **"B"** if it is **not** being used

but you are interested in using it; and "C" if the method of assessment does not apply to your program.

Direct Methods of Assessment

1. C Comprehensive Examinations
2. A Writing proficiency Examinations
3. C National Examinations assessing subject matter knowledge
4. C Graduate Record Exam General Test
5. C Graduate Record Exam Subject Test
6. C Certification Examinations
7. C Licensure Examinations
8. A Locally developed pre-test or post-test for subject matter knowledge
9. B Senior thesis or major project
10. B Portfolio evaluation of student work
11. B Capstone courses
12. B Audio or Video tape evaluations

Indirect Methods of Assessment

1. B Comparison or benchmarking with peer institutions
2. B Job placement of graduates
3. B Employer surveys
4. B Advisory groups from your profession
5. B Graduate school acceptance rates
6. B Student graduation/retention rates
7. B Exit interviews with students graduating or leaving the program
8. B Student satisfaction surveys
9. A Student course evaluations
10. B Focus group discussions
11. B Alumni surveys
12. B Alumni honors, awards, achievements
13. B Analysis of grade distributions
14. B Peer review of courses
15. B Peer review of program
16. B Curriculum/syllabus analysis
17. B Community service/volunteerism participation
18. Other:

Does your program have an experiential learning component? yes X

no

If yes, how do you assess the student learning outcomes from that experience?

1. Participate in a class designed to complement the experience
2. Student journals
3. Formal evaluation procedures from field-based supervisor
4. Formal meetings between supervisor, student, and faculty
5. Formal test of practical skills
6. Other:

Implementation Plans

1. How has your department used any of the indicators above to improve services and programs for students?

The graduate division of the Neuroscience Program has used many of the above indicators to assess the and improve the program, including records of job placement of graduates, comparison or benchmarking with peer institutions, and peer review of program, and we will use the expertise of our unit to do the same for the undergraduate program.

2. When you think about developing and implementing an assessment plan, what concerns do you have?

That the assessment be valid and relevant.

16. Are there admissions requirements for this program?:

Grade or grade-point average requirements and if so in which course(s), portfolio requirement, audition, essay, etc. If there are not admission requirements other than those required by the University policy indicate "none".

none

DEPARTMENT LEVEL APPROVAL STATUS

Approved: Program in Neuroscience
12/22/2011 2:26:41 PM by Laura Symonds for Cheryl Sisk, Director

SIGNOFFS STATUS

Signed Off: Lyman Briggs College
1/3/2012 3:40:52 PM by Kelly Millenbah for Elizabeth H. Simmons, Dean

Comments: Correction needed. Please change the following: CURRENT 3.c.4. LB271 Physics LB 272 Physics II 3

Signed Off: Department of Biochemistry and Molecular Biology
12/22/2011 2:57:28 PM by William Falls for Thomas D. Sharkey, Chairperson

Signed Off: Department of English
12/22/2011 3:22:12 PM by Edward Watts for Steve Arch, Chairperson

Signed Off: Department of Linguistics and Germanic, Slavic, Asian and African Languages
1/3/2012 4:30:27 PM by Tom Lovik for Thomas Lovik, Chairperson

No Response by: Department of Microbiology and Molecular Genetics

Signed Off: Department of Pharmacology and Toxicology
12/22/2011 3:21:23 PM by Diane Hummel for Joseph R. Haywood II, Chairperson

Signed Off: Department of Philosophy
12/27/2011 1:21:49 PM by Matt McKeon for Richard Peterson, Chairperson

No Response by: Department of Physiology

No Response by: Department of Psychology

No Response by: Department of Zoology

COLLEGE LEVEL APPROVAL STATUS

Approved: College of Natural Science
1/9/2012 11:24:35 AM by Teri Roache for Kathryn M. Doig, Associate Dean

© 2012 Office of the Registrar, Michigan State University Board of Trustees. East Lansing, MI 48824
MSU is an affirmative-action, equal-opportunity employer.

COLLEGE OF NATURAL SCIENCE

1. Request to establish a **Bachelor of Science** degree in **Neuroscience** in the College of Natural Science. The University Committee on Undergraduate Studies (UCUS) will consider this request.

- a. **Background Information:**

Recent priorities in biomedical research including those articulated by the National Institutes of Health (NIH) have focused on interdisciplinary approaches to solving problems related to human and animal health. Today's successful investigator must be able to approach problem-solving from a multidisciplinary perspective and work collaboratively with professionals from diverse fields. By its very nature the field of neuroscience is highly interdisciplinary, and cuts across a large number of disciplines, including those within the biological, psychological, engineering, and social sciences.

Neuroscience as a field has experienced exponential growth in the past two decades, reflected for example in the creation of new publication venues and scholarly societies. Naturally the expansion of the field has generated interest in the general public and particularly among undergraduate students who recognize the value of comprehensive training in neuroscience at the undergraduate level.

In light of both the priorities in biomedical research and the growing demand from students, for the past several years faculty in the Neuroscience Graduate Program have been discussing the need to train undergraduates in integrative neuroscience. We recognize that applicants to health professional and biomedical graduate programs with broad training in neuroscience, including critical thinking skills and independent research experience, are both more competitive and better prepared to undertake post-university training (Mennerick, 2011). Graduates with neuroscience training are also prepared for a wide array of career directions including research in government and private industry in which analytical thinking and integrative reasoning are highly valued.

The proposed MSU undergraduate program will be truly interdisciplinary, incorporating upper level courses and research opportunities from departments within the Colleges of Natural Science, Social Science, Arts and Letters, Osteopathic Medicine, and Human Medicine. This will be a particular strength of the MSU neuroscience program. In the 2008-2009 academic year, the most recent year for which there are reliable data, there were 110 undergraduate neuroscience programs in the United States, 72 of them at primarily undergraduate institutions (PUIs) (Ramos et al., 2011). Currently although there is increasing attention to neuroscience-based curricular issues among the Big Ten Universities (e.g., the introduction of a concentration in neuroscience at the University of Michigan), there are only *four* neuroscience degree-granting programs (Indiana, Purdue, Ohio State, and Minnesota). Thus the MSU program will be among the few that have the extensive research facilities and the broad expertise of a large faculty that a research intensive university can offer. Also unique among most neuroscience majors or other programs at other institutions, students who major in neuroscience at MSU will have the opportunity to sample broadly across the neuroscience discipline and take courses not often included in neuroscience concentrations, minors, or even majors (e.g., philosophy; cognitive science). This broad interdisciplinary curriculum in neuroscience is designed to further develop students' communication, reasoning and thinking skills as well as their future success.

- b. **Academic Programs Catalog Text:**

The Bachelor of Science degree in Neuroscience is for students who wish to pursue a career in which a broad-based knowledge of the structure and function of the nervous system is necessary, including careers in research, education, healthcare or business. It is also intended for those students who seek admission to graduate study in neuroscience or health-related professional schools. In addition to core requirements, students can concentrate in cellular and developmental neuroscience; behavioral and systems neuroscience; or cognitive neuroscience.

Requirements for the Bachelor of Science Degree in Neuroscience

1. The University requirements for bachelor's degrees as described in the *Undergraduate Education* section of this catalog; 120 credits, including general elective credits, are required for the Bachelor of Science degree in Neuroscience. The University's Tier II writing requirement for the Neuroscience major is met by completing Neuroscience 311L. That course is referenced in item 3. below.

Students who are enrolled in the College of Natural Science may complete the alternative track to Integrative Studies in Biological and Physical Sciences that is described in item 1. under the heading *Graduation Requirements* in the College statement. Certain courses referenced in requirement 3. below may be used to satisfy the alternative track.

2. The requirements of the College of Natural Science for the Bachelor of Science degree.

The credits earned in certain courses referenced in requirement 3. below may be counted toward College requirements as appropriate.

3. The following requirements for the major:

				CREDITS
a.	One of the following pairs of courses (5 or 6 credits):			
	(1)	CEM 141	General Chemistry	4
		CEM 161	Chemistry Laboratory I	1
	(2)	CEM 151	General and Descriptive Chemistry	4
		CEM 161	Chemistry Laboratory I	1
	(3)	CEM 181H	Honors Chemistry I	4
		CEM 185H	Honors Chemistry Laboratory I	2
	(4)	LB 171	Principles of Chemistry I	4
		LB 171L	Introductory Chemistry Laboratory I	1
b.	One of the following pairs of courses (6 credits):			
	(1)	CEM 251	Organic Chemistry I	3
		CEM 252	Organic Chemistry II	3
	(2)	CEM 351	Organic Chemistry I	3
		CEM 352	Organic Chemistry II	3
c.	One of the following pairs of courses (6 or 8 credits):			
	(1)	PHY 231	Introductory Physics I	3
		PHY 232	Introductory Physics II	3
	(2)	PHY 183	Physics for Scientists and Engineers I	4
		PHY 184	Physics for Scientists and Engineers II	4
	(3)	PHY 193H	Honors Physics I-Mechanics	4
		PHY 294H	Honors Physics II-Electromagnetism	4
	(4)	LB 273	Physics I	4
		LB 274	Physics II	4
d.	One of the following courses (3 or 4 credits):			
		MTH 124	Survey of Calculus I	3
		MTH 132	Calculus I	3
		MTH 152H	Honors Calculus I	3
		LB 118	Calculus I	4
e.	One of the following courses (3 or 4 credits):			
		STT 201	Statistical Methods	4
		STT 231	Statistics for Scientists	3
		STT 421	Statistics I	3
f.	Both of the following courses (8 credits):			
		BMB 401	Comprehensive Biochemistry	4
		PSY 101	Introductory Psychology	4
g.	One of the following groups of courses (8 or 9 credits):			
	(1)	BS 161	Cell and Molecular Biology	3
		BS 162	Organismal and Population Biology	3
		BS 171	Cell and Molecular Biology Laboratory	2
	(2)	BS 181H	Honors Cell and Molecular Biology	3
		BS 182H	Honors Organismal and Population Biology	3
		BS 191H	Honors Cell and Molecular Biology Laboratory	2
	(3)	LB 144	Biology I: Organismal Biology	4
		LB 145	Biology II: Cellular and Molecular Biology	5
h.	One of the following groups of courses (4 or 6 credits):			
	(1)	PSL 310	Physiology for Pre-Health Professionals	4
	(2)	PSL 431	Human Physiology I	3
		PSL 432	Human Physiology II	3
i.	All of the following courses (8 credits):			
		NEU 301	Introduction to Neuroscience I	3
		NEU 302	Introduction to Neuroscience II	3
		NEU 311L	Neuroscience Laboratory (W)	2
j.	One course from each of the following groups of courses (6 credits):			
	(1)	PHM 350	Introductory Human Pharmacology	3
		PHM 431	Pharmacology of Drug Addiction	3
		PHM 480	Special Problems	3
	(2)	MMG 404	Human Genetics	3

	MMG	409	Eukaryotic Cell Biology	3
k.	Complete 15 credits in courses from one of the following concentrations:			
	Cellular and Developmental Neuroscience			
	BMB	400	Introduction to Bioinformatics	3
	MMG	404	Human Genetics	3
	MMG	409	Eukaryotic Cell Biology	3
	NEU	420	Neurobiology of Disease	3
	ZOL	341	Fundamental Genetics	4
	ZOL	343	Genetics Laboratory	3
	ZOL	402	Neurobiology	3
	ZOL	425	Cells and Development (W)	4

Microbiology and Molecular Genetics 404 or 409 may not be used for requirement 3. j. (2) and this concentration.

Behavioral and Systems Neuroscience

	NEU	420	Neurobiology of Disease	3
	PHM	431	Pharmacology of Drug Addiction	3
	PHM	480	Special Problems	1 to 3
	PSY	209	Brain and Behavior	3
	PSY	310	Psychology and Biology of Human Sexuality	3
	PSY	402	Sensation and Perception (W)	3
	PSY	409	Psychobiology of Behavioral Development (W)	3
	PSY	410	Neurobiology of Learning and Memory (W)	3
	PSY	411	Hormones and Behavior (W)	3
	PSY	413	Laboratory in Behavioral Neuroscience (W)	4
	PSY	493	Issues in Psychology (W)	3
	ZOL	313	Animal Behavior	3
	ZOL	403	Integrative Neurobiology	3

Pharmacology and Toxicology 431 may not be used for requirement 3. j. (1) and this concentration.

Cognitive Neuroscience

	ENG	492H	Honors Seminar in English	3
	LIN	455	Neurolinguistics	3
	LIN	463	Introduction to Cognitive Science	3
	PHL	200	Introduction to Philosophy	3
	PHL	462	Philosophy of Mind	3
	PSL	429	Biomedical Imaging Methods	3
	PSY	200	Cognitive Psychology	3
	PSY	209	Brain and Behavior	3
	PSY	301	Cognitive Neuroscience	3
	PSY	401	Memory and Skill (W)	3
	PSY	402	Sensation and Perception (W)	3
	PSY	410	Neurobiology of Learning and Memory (W)	3
	PSY	493	Issues in Psychology (W)	3

Effective Fall 2012.

HUMAN BIOLOGY

UNDERGRADUATE PROGRAM

The human biology major, which leads to the Bachelor of Science degree, is designed for persons who want a broad background in fields that comprise biological sciences and who want to understand the interrelationships among such fields. This program is for persons who plan to pursue careers in the health care professions and for students who are interested in the biological sciences, but are not interested in a teaching option.

Requirements for the Bachelor of Science Degree in Human Biology

1. The University requirements for bachelor's degrees as described in the *Undergraduate Education* section of this catalog; 120 credits, including general elective credits, are required for the Bachelor of Science degree in Human Biology.

The University's Tier II writing requirement for the Human Biology major is met by completing NSC 495. That course is referenced in item 3. a. below.

Students who are enrolled in the College of Natural Science may complete the alternative track to Integrative Studies in Biological and Physical Sciences that is described in item 1. under the heading *Graduation Requirements* in the College statement. Certain courses referenced in requirement 3. below may be used to satisfy the alternative track.

2. The requirements of the College of Natural Science for the Bachelor of Science degree.

The credits earned in certain courses referenced in requirement 3. below may be counted toward College requirements as appropriate.

3. The following requirements for the major:

	CREDITS
a. All of the following courses:	24
BS 161 Cell and Molecular Biology	3
BS 162 Organismal and Population Biology	3
BS 171 Cell and Molecular Biology Laboratory	2
BS 172 Organismal and Population Biology Laboratory	2
CEM 251 Organic Chemistry I	3
CEM 252 Organic Chemistry II	3
CEM 255 Organic Chemistry Laboratory	2
NSC 495 Capstone in Human Biology (W)	2
ZOL 341 Fundamental Genetics	4
b. One of the following, either (1) or (2):	4 or 6
(1) PSL 310 Physiology for Pre-Health Professionals	4
(2) PSL 431 Human Physiology I	3
PSL 432 Human Physiology II	3
c. One of the following, either (1) or (2):	4 or 6
(1) BMB 401 Comprehensive Biochemistry	4
(2) BMB 461 Advanced Biochemistry I	3
BMB 462 Advanced Biochemistry II	3
d. One of the following groups of courses:	9 to 12
(1) CEM 141 General Chemistry	4
CEM 142 General and Inorganic Chemistry	3
CEM 161 Chemistry Laboratory I	1
CEM 162 Chemistry Laboratory II	1
(2) CEM 151 General and Descriptive Chemistry	4
CEM 152 Principles of Chemistry	3
CEM 161 Chemistry Laboratory I	1
CEM 162 Chemistry Laboratory II	1
(3) CEM 181H Honors Chemistry I	4
CEM 182H Honors Chemistry II	4
CEM 185H Honors Chemistry Laboratory I	2
CEM 186H Honors Chemistry Laboratory II	2
e. One of the following groups of courses:	6 or 7
(1) MTH 132 Calculus I	3
MTH 133 Calculus II	4
(2) MTH 132 Calculus I	3
STT 201 Statistical Methods	4
or	
STT 231 Statistics for Scientists	3
(3) MTH 124 Survey of Calculus I	3
MTH 126 Survey of Calculus II	3
(4) MTH 124 Survey of Calculus I	3
STT 201 Statistical Methods	4
or	
STT 231 Statistics for Scientists	3
(5) MTH 152H Honors Calculus I	3
MTH 153H Honors Calculus II	3
f. One of the following pairs of courses:	6 or 8
(1) PHY 183 Physics for Scientists and Engineers I	4
PHY 184 Physics for Scientists and Engineers II	4
(2) PHY 193H Honors Physics I—Mechanics	3
PHY 294H Honors Physics II—Electromagnetism	3
(3) PHY 231 Introductory Physics I	3
PHY 232 Introductory Physics II	3
g. One of the following pairs of courses:	2

(1)	PHY 191	Physics Laboratory for Scientists, I	1
	PHY 192	Physics Laboratory for Scientists, II	1
(2)	PHY 251	Introductory Physics Laboratory I	1
	PHY 252	Introductory Physics Laboratory II	1
h.	One of the following courses:		3
	BLD 434	Clinical Immunology	3
	MMG 409	Eukaryotic Cell Biology	3
	MMG 413	Virology	3
	MMG 451	Immunology	3
i.	At least 12 credits from the following courses:		12
	ANP 441	Osteology and Forensic Anthropology	4
	BLD 204	Mechanisms of Disease	3
	BLD 324	Fundamentals of Hematology, Hemostasis, and Urinalysis	3
	BLD 416	Clinical Chemistry II: Pathophysiology and Body Fluid Analysis	4
	BLD 434	Clinical Immunology	3
	EPI 390	Disease and Society	4
	KIN 310	Physiology Bases of Physical Activity	3
	KIN 330	Biomechanics of Physical Activity	3
	MMG 301	Introductory Microbiology	3
	MMG 302	Introductory Microbiology Laboratory	1
	MMG 404	Human Genetics	3
	MMG 409	Eukaryotic Cell Biology	3
	MMG 413	Virology	3
	MMG 431	Microbial Genetics	3
	MMG 451	Immunology	3
	MMG 461	Molecular Pathogenesis	3
	MMG 463	Medical Microbiology	3
	NSC 496	Directed Study in Human Biology	1 to 3
	NSC 497	Internship in Human Biology	1 to 3
	NSC 498	Research in Human Biology	1 to 3
	PHM 350	Introductory Human Pharmacology	3
	PHM 431	Pharmacology of Drug Addiction	3
	PHM 450	Introduction to Chemical Toxicology	3
	ZOL 402	Neurobiology	3
	ZOL 408	Histology	4
	ZOL 425	Cells and Development (W)	4
	ZOL 450	Cancer Biology (W)	3
	ZOL 483	Environmental Physiology (W)	4
	With the approval of the director of the human biology major, credits in research or independent study courses may be used to satisfy this requirement.		
	Courses used to fulfill requirement 3. h. may not be used to fulfill requirement 3. i.		
j.	One of the following courses:		3 or 4
	ANTR 350	Human Gross Anatomy and Structural Biology	3
	ZOL 320	Developmental Biology	4
	ZOL 328	Comparative Anatomy and Biology of Vertebrates	4

NEUROSCIENCE

Several colleges and departments within Michigan State University cooperate in offering the interdepartmental Master of Science and Doctor of Philosophy degree program with a major in neuroscience, which is administered by the College of Natural Science. Students may elect to complete the requirements for a second major, in addition to the requirements for the Master of Science and Doctor of Philosophy degree in neuroscience.

Students who are enrolled in the master's or doctoral degree program with a major in Neuroscience may also elect an Interdepartmental Specialization in Cognitive Science. For additional information, refer to the statement on *Interdepartmental Graduate Specializations in Cognitive Science* in the *College of Social Science* section of this catalog. For additional information, contact the College of Natural Science.

Master of Science

The major objective of the M.S. program is to provide sufficient theoretical and practical training in neuroscience to allow students to obtain professional level positions in academic, industrial, or governmental institutions.

Admission

Admission to graduate study in neuroscience is primarily to the doctoral program. Students are generally accepted for graduate

Insert ①

Insert ②

The Bachelor of Science degree in Neuroscience is for students who wish to pursue a career in which a broad-based knowledge of the structure and function of the nervous system is necessary, including careers in research, education, healthcare or business. It is also intended for those students who seek admission to graduate study in neuroscience or health-related professional schools. In addition to core requirements, students can concentrate in cellular and developmental neuroscience; behavioral and systems neuroscience; or cognitive neuroscience.

Bachelor of Science

Requirements for the Bachelor of Science Degree in Neuroscience

1. The University requirements for bachelor's degrees as described in the *Undergraduate Education* section of this catalog; 120 credits, including general elective credits, are required for the Bachelor of Science degree in Neuroscience.

The University's Tier II writing requirement for the Neuroscience major is met by completing Neuroscience 311L. That course is referenced in item 3. below.

Students who are enrolled in the College of Natural Science may complete the alternative track to Integrative Studies in Biological and Physical Sciences that is described in item 1. under the heading *Graduation Requirements* in the College statement. Certain courses referenced in requirement 3. below may be used to satisfy the alternative track.

2. The requirements of the College of Natural Science for the Bachelor of Science degree.

The credits earned in certain courses referenced in requirement 3. below may be counted toward College requirements as appropriate.

3. The following requirements for the major:

						CREDITS
a.	One of the following pairs of courses (5 or 6 credits):					
(1)	CEM	141	General Chemistry			4
	CEM	161	Chemistry Laboratory I			1
(2)	CEM	151	General and Descriptive Chemistry			4
	CEM	161	Chemistry Laboratory I			1
(3)	CEM	181H	Honors Chemistry I			4
	CEM	185H	Honors Chemistry Laboratory I			2
(4)	LB	171	Principles of Chemistry I			4
	LB	171L	Introductory Chemistry Laboratory I			1
b.	One of the following pairs of courses (6 credits):					
(1)	CEM	251	Organic Chemistry I			3
	CEM	252	Organic Chemistry II			3
(2)	CEM	351	Organic Chemistry I			3
	CEM	352	Organic Chemistry II			3
c.	One of the following pairs of courses (6 or 8 credits):					
(1)	PHY	231	Introductory Physics I			3
	PHY	232	Introductory Physics II			3
(2)	PHY	183	Physics for Scientists and Engineers I			4
	PHY	184	Physics for Scientists and Engineers II			4
(3)	PHY	193H	Honors Physics I-Mechanics			4
	PHY	294H	Honors Physics II-Electromagnetism			4

	(4)	LB	273	Physics I	4
		LB	274	Physics II	4
d.	One of the following courses (3 or 4 credits):				
	MTH	124	Survey of Calculus I		3
	MTH	132	Calculus I		3
	MTH	152H	Honors Calculus I		3
	LB	118	Calculus I		4
e.	One of the following courses (3 or 4 credits):				
	STT	201	Statistical Methods		4
	STT	231	Statistics for Scientists		3
	STT	421	Statistics I		3
f.	Both of the following courses (8 credits):				
	BMB	401	Comprehensive Biochemistry		4
	PSY	101	Introductory Psychology		4
g.	One of the following groups of courses (8 or 9 credits):				
	(1)	BS	161	Cell and Molecular Biology	3
		BS	162	Organismal and Population Biology	3
		BS	171	Cell and Molecular Biology Laboratory	2
	(2)	BS	181H	Honors Cell and Molecular Biology	3
		BS	182H	Honors Organismal and Population Biology	3
		BS	191H	Honors Cell and Molecular Biology Laboratory	2
	(3)	LB	144	Biology I: Organismal Biology	4
		LB	145	Biology II: Cellular and Molecular Biology	5
h.	One of the following groups of courses (4 or 6 credits):				
	(1)	PSL	310	Physiology for Pre-Health Professionals	4
	(2)	PSL	431	Human Physiology I	3
		PSL	432	Human Physiology II	3
i.	All of the following courses (8 credits):				
	NEU	301	Introduction to Neuroscience I		3
	NEU	302	Introduction to Neuroscience II		3
	NEU	311L	Neuroscience Laboratory (W)		2
j.	One course from each of the following groups of courses (6 credits):				
	(1)	PHM	350	Introductory Human Pharmacology	3
		PHM	431	Pharmacology of Drug Addiction	3
		PHM	480	Special Problems	3
	(2)	MMG	404	Human Genetics	3
		MMG	409	Eukaryotic Cell Biology	3
k.	Complete 15 credits in courses from one of the following concentrations:				
	Cellular and Developmental Neuroscience				
	BMB	400	Introduction to Bioinformatics		3
	MMG	404	Human Genetics		3
	MMG	409	Eukaryotic Cell Biology		3
	NEU	420	Neurobiology of Disease		3
	ZOL	341	Fundamental Genetics		4
	ZOL	343	Genetics Laboratory		3
	ZOL	402	Neurobiology		3
	ZOL	425	Cells and Development (W)		4
	Microbiology and Molecular Genetics 404 or 409 may not be used for requirement 3. j. (2) and this concentration.				
	Behavioral and Systems Neuroscience				
	NEU	420	Neurobiology of Disease		3
	PHM	431	Pharmacology of Drug Addiction		3
	PHM	480	Special Problems		1 to 3
	PSY	209	Brain and Behavior		3
	PSY	310	Psychology and Biology of Human Sexuality		3

PSY	402	Sensation and Perception (W)	3
PSY	409	Psychobiology of Behavioral Development (W)	3
PSY	410	Neurobiology of Learning and Memory (W)	3
PSY	411	Hormones and Behavior (W)	3
PSY	413	Laboratory in Behavioral Neuroscience (W)	4
PSY	493	Issues in Psychology (W)	3
ZOL	313	Animal Behavior	3
ZOL	403	Integrative Neurobiology	3

Pharmacology and Toxicology 431 may not be used for requirement 3. j. (1) and this concentration.

Cognitive Neuroscience

ENG	492H	Honors Seminar in English	3
LIN	455	Neurolinguistics	3
LIN	463	Introduction to Cognitive Science	3
PHL	200	Introduction to Philosophy	3
PHL	462	Philosophy of Mind	3
PSL	429	Biomedical Imaging Methods	3
PSY	200	Cognitive Psychology	3
PSY	209	Brain and Behavior	3
PSY	301	Cognitive Neuroscience	3
PSY	401	Memory and Skill (W)	3
PSY	402	Sensation and Perception (W)	3
PSY	410	Neurobiology of Learning and Memory (W)	3
PSY	493	Issues in Psychology (W)	3

study in neuroscience only if judged by a program committee to be qualified to complete the doctoral degree. However, under certain circumstances, the program may consider applications for admission to the Master of Science in Neuroscience from students who wish to earn a master's degree in preparation for the doctoral degree. For consultation, contact the program director.

To be considered for admission to the Master of Science degree in Neuroscience an applicant should:

1. have taken a broad spectrum of basic science courses.
2. have a grade-point average of at least 3.0 in science and mathematics courses.

To be eligible for regular admission to the Master of Science degree in Neuroscience, an applicant must:

1. have completed an undergraduate degree in a biological or physical science or a related discipline.
2. have earned an overall grade-point average of 3.0.
3. have the results of the Graduate Record Examination (GRE) General Test forwarded to the College of Natural Science.

Laboratory research experience is recommended, but not required. Applicants with deficiencies in academic preparation may be admitted provisionally, with the requirement that they complete collateral science courses during the first year of study; these collateral courses will not count toward the degree.

Admission decisions are made by the Neuroscience Program Graduate Affairs Committee.

In addition to meeting the requirements of the university and the College of Natural Science, students must meet the requirements specified below.

Requirements for the Master of Science Degree in Neuroscience

The program is available under either Plan A (with thesis) or Plan B (without thesis). A total of 30 credits is required for the degree under either Plan A or Plan B. The student's program of study must be approved by the student's guidance committee. The student must meet the requirements specified below:

	CREDITS
Requirements for Plan A and Plan B	
1. Complete all of the following courses (17 credits):	
NEU 804 Molecular and Developmental Neurobiology	3
NEU 806 Advanced Neuroscience Techniques Laboratory	3
NEU 839 Systems Neuroscience	4
PHM 827 Physiology and Pharmacology of Excitable Cells	4
PSY 811 Advanced Behavioral Neuroscience	3
2. Complete one of the following courses (3 credits):	
PHM 830 Experimental Design and Data Analysis	3
PSY 815 Quantitative Research Design and Analysis in Psychology	3
3. Complete a minimum of 6 credits in Neuroscience 800 or 899. Plan A students must complete 4 credits of Neuroscience 899.	
4. Complete an additional 4 credits of elective courses related to the student's research and approved by the student's guidance committee. These credits may be earned in Neuroscience 800 or 899 if the student chooses.	
5. Complete a one semester laboratory rotation with each of two neuroscience faculty in the first year of study. Students will select the two laboratories in which they will rotate at the beginning of fall semester based on discussions and mutual agreement with neuroscience faculty members.	

Additional Requirements for Plan A
 Successful completion and defense of a thesis based on original research on an important problem in neuroscience in a seminar-based public forum.

Additional Requirements for Plan B
 Successful completion and presentation of a research-based paper.

Doctor of Philosophy

The program provides an opportunity for doctoral students to acquire both a broad and in-depth knowledge of the function of the nervous system. The program is designed to:

1. Make it possible for a doctoral student to obtain a comprehensive and contemporary academic experience in the field of neuroscience.
2. Prepare students for their future professional obligations and responsibilities as scholars.

3. Develop an intellectual environment that will foster the growth of research and teaching in the area of neuroscience.

In addition to meeting the requirements of the university and of the College of Natural Science, students must meet the requirements specified below.

Admission

To be considered for admission to the Doctor of Philosophy degree program with a major in neuroscience, an applicant should have:

1. Completed a broad spectrum of basic science courses.
2. A grade-point average of at least 3.0 in science and mathematics courses.
3. Experience in laboratory research.

To be eligible for regular admission to the Doctor of Philosophy degree program with a major in neuroscience, an applicant must have:

1. Completed an undergraduate degree in a biological, psychological, or physical science or in a related discipline.
2. An overall grade-point average of at least 3.0.
3. Satisfactory scores on the Graduate Record Examination General Test as judged by the faculty.

Admission decisions are made by the Neuroscience Program Admissions Committee. Applicants with deficiencies in academic preparation may be admitted provisionally, with the requirement that they complete collateral science courses during the first year of study; these collateral courses will not count toward the degree.

Requirements for the Doctor of Philosophy Degree in Neuroscience

The student must:

- | | CREDITS |
|---|---------|
| 1. Complete all of the following courses: | |
| NEU 800 Neuroscience Research Forum | 4 |
| NEU 804 Molecular and Developmental Neurobiology | 3 |
| NEU 806 Advanced Neuroscience Techniques Laboratory | 3 |
| NEU 839 Systems Neuroscience | 4 |
| NEU 890 Independent Study in Neuroscience | 4 |
| NEU 999 Doctoral Dissertation Research | 24 |
| PHM 827 Advanced Neurobiology | 4 |
| PSY 811 Advanced Behavioral Neuroscience | 3 |
| 2. Complete one of the following courses (3 credits): | |
| PHM 830 Experimental Design and Data Analysis | 3 |
| PSY 815 Quantitative Research Design and Analysis in Psychology | 3 |
| 3. Complete in the first year of enrollment in the program a one-semester laboratory rotation (NEU 890) with <i>each</i> of two members of the faculty. Each rotation is established by mutual agreement of the faculty member and the student. | |
| 4. Pass the written comprehensive examination given at the end of the second year of enrollment in the program. | |
| 5. Complete and orally defend a dissertation research proposal. | |
| 6. Complete and defend a dissertation based on original research on an important problem in neuroscience. | |
| 7. All students must complete Responsible Conduct of Research Training. | |

The colleges and departments that are listed below cooperate in offering the interdepartmental Doctor of Philosophy degree program with a major in neuroscience:

Colleges

- Human Medicine
- Osteopathic Medicine
- Social Science
- Veterinary Medicine

Departments

- Anatomy (Division of)
- Biochemistry and Molecular Biology
- Pathobiology and Diagnostic Investigation
- Pharmacology and Toxicology
- Physiology
- Psychology
- Zoology

A detailed description of the Doctor of Philosophy degree program with a major in neuroscience and of the research interests of participating faculty may be obtained upon request from the Neuroscience Program Administrative Office, 108 Giltner Hall, Michigan State University, East Lansing, MI 48824-1317, or by visiting the Web site at <http://www.neuroscience.msu.edu>.

NEUROSCIENCE—ENVIRONMENTAL TOXICOLOGY

Doctor of Philosophy

For information about the Doctor of Philosophy degree program in neuroscience—environmental toxicology, refer to the statement on *Doctoral Program in Environmental and Integrative Toxicological Sciences* in the *Graduate Education* section of this catalog.