



PennState

Huck Institutes of
the Life Sciences

Graduate Program in Neuroscience

University Park Campus

Student and Faculty Handbook

Fall 2019

Neuroscience Graduate Program: <http://www.huck.psu.edu/content/graduate-programs/neuroscience>

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NEUROSCIENCE

Mission

The primary mission of the Graduate Program in Neuroscience is to train students interested in obtaining a doctoral degree in the field of Neuroscience. Each student receiving a PhD in Neuroscience must submit an approved doctoral research proposal and successfully defend the findings and conclusions resulting from that research. Information on Neuroscience faculty members and their research projects can be found at <https://www.huck.psu.edu/graduate-programs/neuroscience/people/faculty>.

Academic Requirements

The Neuroscience Graduate curriculum consists of required courses and electives. Courses in the core areas of neuroscience include neuroanatomy (NEURO 511/512), molecular and cellular neurobiology (NEURO 520), systems neuroscience (NEURO 521), and neural development (BIOL 426). All neuroscience graduate students are also required to attend the program's neuroscience seminar series (NEURO 501), receive training in Ethics and the Responsible Conduct of Research, and conduct research supervised by a faculty member in the Neuroscience Graduate Program. For the PhD, students may take no more than 12 graded credits (A-F) of Thesis Research (NEURO 600). In cases where a student has been approved to receive a Masters degree in Neuroscience, the student may take no more than 6 graded credits for their thesis research. [Appendix 1](#) indicates a typical timeline of the required coursework in the neuroscience curriculum.

In addition to the required core courses in [Appendix 2](#), students must take at least two elective courses during the first two years. Electives include 400 and 500 level courses that are approved by the Thesis Advisor and the Neuroscience Program Co-Director. Although not required, students are strongly encouraged to take one or more statistics courses that are relevant to their thesis research. A sample of elective courses taken by neuroscience students in recent years is shown in [Appendix 3](#).

Full time student status requires at least nine credits each fall and spring semester before the comprehensive exam. After passing the comprehensive exam, students may register for Thesis Preparation (NEURO 601). Information about all Graduate School policies can be found at www.gradschool.psu.edu/current-students/, <http://www.gradschool.psu.edu/current-students/student/>, and <http://gradschool.psu.edu/graduate-education-policies/>.

Laboratory Rotations

Students are encouraged but are not required to take laboratory rotations. Typically, a student takes up to three 4-week lab rotations in the first Fall semester. Rotations provide students with an opportunity to participate in different projects and laboratory environments so that they can select a thesis project and advisor. Rotation advisors should provide students with clear expectations of their responsibilities during the rotation, and the student should meet regularly with the advisor to discuss the progress of the rotation. Students may choose any member of the Neuroscience Graduate Faculty for a rotation. If research in a specific lab matches your interest, you should make an appointment to discuss the rotation plan with the faculty member. The Co-Director will be available to provide guidance to narrow your choices. Students taking laboratory rotations should be enrolled in NEURO 596, typically for 1.0 credit per semester.

Faculty Advisors

The Neuroscience Program Co-Director is the faculty advisor for students entering the program, and this person is available for specific questions about the program and for more general discussions of a student's progress. After a student has selected a faculty thesis advisor, that faculty member assumes these responsibilities.

Thesis Advisor

Students should choose a thesis advisor and research laboratory by the end of their first academic year. A student may choose any lab supervised by a member of the Neuroscience Graduate Faculty provided the

faculty member agrees and has space and resources for the student's research. Students should have rotated with the faculty member and be familiar with the laboratory environment and its research mission. Guidelines for interactions between the thesis advisor and the graduate student appear in [Appendix 4](#).

Responsible Conduct of Research

All neuroscience students must complete an online Responsible Conduct of Research (RCR) training course. First-year students are strongly encouraged to take this course their during summer orientation, which occurs prior to the beginning of the fall semester. The online course is offered through the CITI (Collaborative Institutional Training Initiative) Program. This on-line course supplements in-class, discussion-based RCR training that is provided in Ethics in the Life Sciences (MCIBS 591), a required 1-credit course taken during the second year. Together, these two courses satisfy RCR training requirements mandated by Penn State's Scholarship and Research Integrity (SARI) Program, an RCR initiative organized through the Office for Research Protections within the Office of the Vice President for Research.

To register for RCR training, go to the Penn State CITI website <http://citi.psu.edu/> where you will find instructions. After selecting Pennsylvania State University as the participating institution, register for either the CITI **Biomedical Science** course (for most students) or the CITI **Human Subject Research** course. The latter is suitable for students who anticipate doing thesis research with human subject participants; it meets both general RCR requirements and specific RCR training required by the Institutional Review Board (IRB) for Human Participants Research at Penn State. Whichever course is chosen, students must work on their own to complete the course modules and pass the on-line quizzes. Students are required to complete all modules before the end of the first Fall semester. A copy of the student's Completion Report must be submitted to Ms. Jean Pierce, jep32@psu.edu, in the administrative office for the Neuroscience Program in 101 Life Sciences.

Safety Training

Within the first semester of residence, all students are required to take/pass the laboratory safety and chemical waste disposal training sessions offered at the respective campus. Typically, University Park Laboratory Safety training will be completed before (online modules) and during (in-person) program orientation. Information about additional training sessions can be found at the Environmental Health and Safety website, <https://ehs.psu.edu/>, and should be administered through any lab in which the student is rotating or working.

Research and Teaching Assistantships

First-year students receive their stipends from the Huck Institutes. After the first year, students receive stipends in the form of a teaching or research assistantship, which typically originates with the department of the faculty advisor. All students must be registered as full time students to maintain stipend eligibility. If no faculty advisor has been identified, students should consult with the Co-Director of the Neuroscience Graduate Program.

Student Presentations

After their first year, students are required to give an annual presentation of their research to other students and faculty in the neurosciences. These presentations are intended to keep the faculty and fellow students apprised of progress in research and to provide practice in presentation. Students are also expected to use these opportunities to inform the doctoral committee of their research progress.

Academic Integrity Policy

According to Penn State's Code of Conduct (Faculty Senate Policy 49-20, <https://senate.psu.edu/policies-and-rules-for-undergraduate-students/47-00-48-00-and-49-00-grades/#49-20>), "all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts." Students should not "engage in or tolerate acts of falsification, misrepresentation or deception. Acts of dishonesty violate the ethical

principles of the University community and compromise the worth of work completed by others". Academic dishonesty, cheating, and plagiarism will not be tolerated in the Neuroscience Graduate Program and will result in disciplinary sanctions including dismissal from the program. University Policies for handling student misconduct are available at: <http://undergrad.psu.edu/aappm/G-9-academic-integrity.html>.

Scholarship Policy

Students are required to have a minimum grade-point average of 3.0 for the doctoral qualifying examination, admission to the comprehensive examination, thesis defense, and graduation. One or more failing grades, a cumulative grade-point average below 3.0, or failing any of the required examinations are considered evidence of unsatisfactory scholarship and are grounds for dismissal from the University (see <http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-800/gcac-803-procedures-termination-unsatisfactory-scholarship/>).

Qualifying Examination (summer of first year)

The Qualifying Exam is taken by each first-year student immediately following completion of the spring semester. For this purpose, each student is expected to remain on campus for the months of May, June, and July, or until testing is completed. A student must have a minimum grade-point average of 3.0 to be eligible for the Qualifying Examination. Passing the Qualifying Exam establishes that the student has sufficient proficiency to continue pursuit of a doctoral degree in the Neuroscience Program.

Format

The Qualifying Examination consists of written and oral components, both of which are administered by the Neuroscience Curriculum Committee. The oral component, which is usually scheduled first, examines the student's ability to demonstrate working knowledge of the information acquired in the first year of the neuroscience curriculum.

The written component assesses student knowledge of experimental design and the techniques used to address specific issues in neuroscience. To pass the written component, students must develop an experimental plan that tests specific hypotheses that are approved in advance by the curriculum committee. Within three weeks of receiving this approval, the student must submit a written plan in the format of an NIH F31 grant application. Students can use a wide range of source materials including published research articles in the primary literature.

Students are judged on their combined performance on the written and oral portions of the exam. In the event of failure, the Neuroscience Curriculum Committee determines whether the student may take another examination. If the second exam is failed, the student may be dismissed from the program.

Annual Graduate Student Activity Report (GSAR)

Annual Evaluations are an integral part of the student's professional development. The thesis advisor (or the Program Chair for students not yet settled in a lab) should conduct annual evaluations of the student's progress and overall performance and provide guidance with regard to future goals. While students and their advisors should meet regularly over the course of a year, the annual evaluations ensure that at least one meeting has been held to specifically look at the student's progress and performance. Continuation of financial support of each student will be dependent on satisfactory progress as stated in admission offer letters.

The online Annual Graduate Student Activity Report, <https://grad-activity.science.psu.edu/>, will be sent to all Huck graduate students each spring semester from the Huck Institutes Graduate Programs Office.

This online evaluation must be completed and approved by August 15 each year. There will be earlier deadlines for each component of the report.

Each student, in consultation with their advisor, will describe their research progress and plans according to the prompts that appear on the online form under the section “Progress and Future Plans”:

- 1) Please provide a brief description of the current status of your research project.
- 2) Please describe your research accomplishments over the past year.
- 3) Please provide a description of your research plans for the upcoming year.

In addition to this information, each student should provide all of the requested information such as publications, meetings attended, etc. The online system is self-explanatory but the Huck Graduate Education Office will be happy to assist as necessary. Completed student reports will be reviewed by the Program Chair and, when appropriate, by Troy Ott, Associate Director for Graduate Education in the Huck.

Formation of a Doctoral Committee (in the second year)

In the second year, after passing the qualifying examination, the student will form a doctoral committee in consultation with their thesis advisor. The committee is chaired by the student's thesis advisor, except in rare circumstances. The doctoral committee provides general guidance for the student, and it administers both the Comprehensive Examination and the Thesis Defense. Committee members should be knowledgeable and interested in the general area of the proposed research.

The student should meet with the doctoral committee at least once each year. It is the student's responsibility to organize these meetings. Committee meetings typically occur immediately after the student's annual presentation in a formal seminar. Students are expected to document in writing for the doctoral committee their progress on thesis research and their future plans.

Formal approval of the Thesis Committee by the Graduate School is required. Students should contact the Huck Graduate Program Office to complete the necessary paperwork for formalizing or revising their Committee.

Composition of the Doctoral Thesis Committee

Consistent with Graduate School policy (<http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-602-phd-committee-formation/>), a Doctoral Thesis Committee in the Neuroscience Program should have:

- At least 4 members from the PSU Graduate Faculty.
- At least 2 members in the Neuroscience Program, both of which are in the PSU Graduate Faculty.
- At least one outside member in the PSU Graduate Faculty who is in a department different from the department of the thesis advisor. The outside member should represent a field outside the candidate's major field to provide a broader disciplinary perspective and expertise.

A person not affiliated with PSU may be a special member beyond the 4 members of the PSU Graduate Faculty upon approval of the Director of the Neuroscience program and Graduate Dean. A memo plus the individual's C.V. must be drafted with approval signature spaces for the Graduate Program Director and the Director of Graduate Student Services.

Comprehensive Examination (end of second year)

The Comprehensive Exam is designed to test the student's ability to construct a detailed experimental plan that addresses a specific issue in neuroscience. This exam must be taken after the end of the second year and before the end of the fifth semester. The Comprehensive Examination is administered by the student's doctoral committee, and it consists of a written research proposal followed by an oral examination. The

student must have a minimum grade-point average of 3.0 to be eligible to take the Comprehensive Examination. In addition, the student must satisfy the English competence requirement and have completed all required coursework. The oral examination must be formally scheduled by the Huck Graduate Office, which requires three weeks' notice.

Written Proposal

The proposal may be on any neuroscience topic, including the student's prospective thesis research. The proposal should follow the format of a NIH Predoctoral (F31) Fellowship application. The Specific Aims must be agreed upon by the student and his/her thesis advisor. After agreeing to the wording of the Specific Aims, the student's advisor should have as little to do with the proposal as possible because the work has to be original. The student is free to use published (or in press) papers that are available, but the logic, experimental design, and writing must belong entirely to the student. The written proposal must be completed and delivered to the members of the doctoral committee at least one week before the oral examination. The proposal does not need to correspond to the student's intended dissertation research, although it usually does. The purpose of the exam is to test the student's ability to develop a coherent research plan and support that plan with logical, literature-based arguments.

Oral Examination

The student must provide a formal presentation of the scientific background, rationale, and general approach of the research plan for each Specific Aim in the written proposal (approx. 30 – 45 minutes). During this presentation, the doctoral committee may interrogate the student on all aspects of the proposed experiments, predicted results, interpretation of data, and knowledge of background material. At least three persons on the doctoral committee, including the Committee Chair and Thesis Advisor, must be physically present and no more than one person on the committee can participate by telephone. The student needs approval from 2/3 of the committee to pass the comprehensive exam.

Evaluation

Students are judged on their combined performance in the written and oral portions of the exam. A favorable vote of at least two-thirds of the committee is required for passing. In the event of failure, the examining committee will determine whether the student may take another examination.

Dissertation & Final Oral Examination

Completion of the requirements for a Ph.D. degree in the Neuroscience Intercollege Graduate Degree Program entails the preparation of a dissertation (written thesis), a final oral examination (thesis defense), and formal acceptance of the thesis by the student's doctoral committee. The thesis defense is administered by the student's doctoral committee. The student must have a minimum grade-point average of 3.0 to be eligible to defend. The student needs to submit paperwork to the Huck Graduate office 3-4 weeks prior to scheduled defense.

Written Thesis Preparation

The Graduate School has strict guidelines for preparing and formatting the written thesis; see Graduate School Policies (<http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-607-dissertation-research-doctorate/>) and The Graduate School's Thesis and Dissertation Information webpage (<http://www.gradschool.psu.edu/current-students/etd/>) for details. Extensive consultation with the thesis committee is strongly encouraged: it is expected that the student should distribute one or two drafts of the dissertation to committee members for review and critique prior to the defense. Students should provide a draft of the dissertation no less than 2 months before the thesis defense so that revisions can be incorporated and the dissertation is in final form for the oral defense.

Applying for Graduation

At the beginning of the semester in which the student wishes to graduate, they must Apply for Graduation. This is done through LionPATH (<http://www.lionpath.psu.edu/>). Contact the Huck Graduate Office for details.

Students must present their thesis in accordance with the Penn State University guidelines as described in the **Thesis and Dissertation Guide** available at <http://gradschool.psu.edu/current-students/etd/> or from the Thesis Office in 115 Kern Building (814/865-5448).

To facilitate submission of paperwork and scheduling of the oral examination, contact
Jean Pierce 101 Life Sciences Bldg.; 814-867-0371; jep32@psu.edu

Oral Thesis Defense

The final oral examination consists of a public presentation of the thesis research, followed by a closed meeting with the student's doctoral committee. The examination should be scheduled after the student has fulfilled all other Graduate School requirements for the degree; three weeks' notice is required by the Graduate School for scheduling this examination. The final version of the dissertation should be delivered to the members of the doctoral committee two weeks before the defense. A favorable vote of at least two-thirds of the thesis committee is required for passing the final oral examination.

Consistent with Graduate School policy, the doctoral candidate and a minimum of three committee members, including the Committee Chair and Thesis Advisor, must be physically present for the thesis defense. No more than one committee member may participate by telephone. Telephone or video-conference arrangements must be approved by the Dean of the Graduate School. A memo can be generated by the Huck Graduate Programs Office for this special request.

Thesis Acceptance

This is the final step of the process: the thesis must be accepted, as indicated by the signatures of two-thirds of the doctoral committee and the Co-Director of the Graduate Program in Neuroscience.

Thesis Submission and Exit Interview

Upon completion of the degree, students are to provide the Neuroscience Graduate Program with a copy of their thesis. The Huck Graduate Office sends an Exit Survey to each graduating student. Students will also meet with the Co-Director of the Neuroscience Graduate Program or an appropriate representative to discuss their doctoral training at Penn State and provide suggestions for improving the program.

Additional Information

Internships (optional)

The internship experience is optional. All graduate students who are members of the Huck Institutes of the Life Sciences may participate in an external work internship that may be available in academia, industry, or government. Students can receive one credit on their transcript by enrolling in MCIBS 595 and a grade of R (satisfactory/passing) or U (unsatisfactory/failing). Non-traditional settings are also available. Students interested in this opportunity should initiate discussion early on with their advisor and Graduate Program Director to identify suitable internships and the best time for this experience (typically in summer). Contacts, positions, applications, course registration, course requirements, and grading are processed through the Eberly College of Science Cooperative Education Program (814-865-5000).

Teaching Opportunities

Teaching opportunities are available, and students interested in teaching should initiate discussions with their advisor and the Director of the Neuroscience Program to determine the best timing for this experience. The student will need to register for teaching assistant training (e.g. a departmental course such as BIOL 893 (Experiential Teaching in Biology) or the New Instructor Orientation Course offered by the Schreyer Institute for Teaching Excellence: <http://www.schreyer institute.psu.edu/Events/NIO/>).

During the semester in which they teach and develop their teaching skills in a classroom setting, students register for MCIBS 602 and receive one credit on their transcript. A teaching certificate, which documents the student's teaching commitment and experience, can be obtained from the graduate school. For more information on how to obtain a teaching certificate, please visit the graduate school website: <http://gradschool.psu.edu/current-students/tacert/>.

Vacation and Sick Days, Leaves of Absence

In general, vacation time should not exceed a total of 10 days (2 weeks) per year, exclusive of the 11 designated University holidays. Days at scientific meetings or training conferences are not vacation time (extra days before or after the meeting would count as vacation). Students may take more than the regularly allocated vacation time in any given calendar year for special travel or activities if they have the **consent of their research advisor** and they take correspondingly fewer vacation days in the preceding and/or following years.

Students must inform their research advisor (or the Graduate Program Chair if a research advisor has not yet been assigned) of their vacation plans at least 15 days before the first day of their vacation. The student should submit their vacation request in writing and obtain written approval from their advisor (an email will suffice). While advisor/Program Chair will usually approve most reasonable requests, requests can be denied if there are circumstances that warrant such a denial. Such denials should not, however, impede a student from using all of their annual vacation time in a reasonable fashion.

These recommended guidelines are advisory and reflect those suggested by government agencies such as National Science Foundation and National Institutes of Health for training grant fellows. Students should consult with their advisor regarding any absences that affect other group members in the advisor's lab. Common sense policies and procedures should apply. Note that vacation time should be planned to avoid interference with specific duties including teaching.

Huck Institutes Resources

The Huck Institutes Travel Award

The Huck Institutes of the Life Sciences provide Travel Awards to Ph.D. students enrolled in all Huck graduate programs who will give poster and/or oral presentations at domestic or international conferences. To apply for this travel award, submit a request form at <https://wiki.vpr.psu.edu/display/HUCKGPA/Graduate+travel+award+requests>. The application will be sent to the Chair for review and approval. The maximum award for domestic travel is \$750, and the maximum award for international travel is \$1,500. These funds may be used for transportation, lodging, and meeting registration fees; meals and per diem charges are not allowed. Students are eligible to receive this award twice during their study at Penn State (for 2 domestic or 1 domestic and 1 international meeting).

Graduate Student Professional Development System

A successful career in Neuroscience requires more than scientific knowledge and technical ability. To help you obtain the professional skills needed to be successful in securing a satisfying and rewarding career, the Huck Institutes has created a Professional Development System that includes seminars, workshops, and other resources aimed at developing your skills so that you can take advantage of a broad range of professional opportunities. See the following website for more details:

<https://www.huck.psu.edu/resources/students/graduate-students/professional-development/professional-development-overview>

Writing Skills

The ability to communicate succinctly in the scientific enterprise is paramount for success. Effective writing is an essential skill for the submission of abstracts, manuscripts, and grant applications, all of which are used to summarize and report one's scientific findings. It is also important to develop your ability to explain your scientific endeavors to audiences outside your field or to the lay public. To improve the quality, clarity, and effectiveness of your written communication, please consult the [Writing Skills](#) website offered by the Huck Institute or any of the following resources offered on this campus:

- [The Penn State Graduate Writing Center](#)
- [Writing Guidelines for Engineering and Science](#) by Dr. Michael Alley
- [The Graduate School Grant Writing Workshops](#)
- [Apply to](#) take part in the Graduate and Professional Student Association's Dissertation and Thesis [Boot](#) Camp - a week-long event held in a quiet section of the library that includes informational workshops on issues related to writing as well as dedicated writing time. For more information on when the bootcamp is each semester, visit the [GPSA website](#).
- For international graduate students and visiting scholars, you can attend [weekly English writing tutorial sessions](#) at The Learning Center in 7 Sparks Building on Tuesdays from 1-2pm (visiting scholars) or 2-3pm (graduate students).

Individual Development Plan

To help set career goals, students are encouraged to register at myIDP (<http://myidp.sciencecareers.org/>) and use the resources there to gain strategies for charting a successful career. This website provides:

- Exercises to examine your skills, interests, and values
- A list of 20 scientific career paths with a prediction of which ones best fit your skills and interests
- A tool for setting strategic goals for the coming year, with optional reminders to keep you on track

Huck Graduate Student Advisory Committee

This Graduate Student Advisory Committee represents all graduate students in the Huck Institutes of the Life Sciences. Its mission is to promote graduate student interests, facilitate communication

among students and faculty, and help guide students in their career plans. More information is available at:

<https://www.huck.psu.edu/resources/students/graduate-students/graduate-student-involvement/huck-graduate-student-advisory-committee>.

Huck Institutes Graduate Network on LinkedIn

Students who may be interested in jobs in industry are encouraged to join the Penn State Huck Institutes Graduate Network on LinkedIn: <https://www.linkedin.com/groups/8278299/>. LinkedIn is no longer just a place for business- and marketing-oriented networking – scientists in both industry and academia are beginning to catch on to the benefits of on-line networking.

Competence in Written and Spoken English

The Graduate School requires that all PhD candidates demonstrate high-level competence in the English language, including reading, writing, and speaking. Competence in written and spoken English is assessed as part of the qualifying exam.

All international students and other students for whom English is not their native language are required to take the American English Oral Communicative Proficiency Test (AEOCPT) which is administered by the University's Department of Applied Linguistics. Given at the beginning of fall and spring semesters, international students are required to pre-register for the AEOCPT. The test scores from the AEOCPT are posted on the University's Administrative Information System (AIS) secure website. A score above 250 on the AEOCPT satisfies the Department's requirement; students scoring under 250 must take courses to improve their spoken language and retake the test before being allowed to teach, as prescribed by the Graduate School.

Students who are required to enroll in English as a Second Language (ESL) must complete the ESL requirement by the end of the second semester. Students who fail this requirement may be terminated from the respective graduate program at the discretion of the Program Director.

Below is the course of action for the AEOCPT score ranges:

AEOCPT SCORE	REQUIRED COURSE	PROGNOSIS
250 - 300	None	Student may teach with no restrictions.
200 - 249	ESL 118G	Must pass the Interactive Performance Test (IPT) before teaching.
150 – 199	ESL 117G followed by ESL 118G	Two semesters of ESL, then IPT before teaching.
<150	ESL 115G, then ESL 117G, then ESL 118G	Three semesters of ESL, then IPT before teaching.

Other Graduate Neuroscience Programs

MD-PhD Program

Students in the MD/PhD program who select the Neuroscience option at the University Park campus for their doctoral thesis research must satisfy requirements similar to traditional doctoral students in the Neuroscience Graduate Program. During their first two years in the Neuroscience Program, MD/PhD students are required to take the following core courses: Seminars in Neuroscience (NEURO 501- 8 credits), Cellular and Molecular Neuroscience (NEURO 520), Systems Neuroscience (NEURO 521), and Ethics in the Life Sciences (MCIBS 591). Students in the MD/PhD program are expected to register for 9-12 credits

each semester until the Comprehensive Exam has been passed. Beyond the core courses listed above, MD/PhD students may take additional courses recommended by their advisor. Students can also register for Thesis Research (NEURO 600) to obtain a total of 9-12 credits per semester.

Masters (M.S.) Degree in Neuroscience

Masters students must have a minimum of 30 credits and a 3.0 overall GPA (see Graduate School Policies, <http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-631-degree-requirements-research-masters/>). Of these 30 credits, at least 18 must be core courses in the Neuroscience Graduate Program. To qualify for the Masters degree, the following core courses are required: Seminars in Neuroscience (NEURO 501 - 4 credits), Comparative Neuroanatomy (NEURO 512 – 4 credits), Cellular and Molecular Neuroscience (NEURO 520 - 3 credits), Systems Neuroscience (NEURO 521 – 3 credits), Developmental Neurobiology (BIOL 426 - 3 credits), and Ethics in the Life Sciences (MCIBS 591 - 1 credit). Credits from Internships (NEURO 595) and Lab Rotations (NEURO 596) count toward the 30 credits, but Teaching credits (MCIBS 602) do not. If all course credits and requirements are met, students do not have to be registered for classes while writing and/or defending their research work (unless they are still funded as a graduate assistant or teaching assistant).

A written thesis is required to obtain a Masters degree in the Neuroscience Graduate Program. The student must select a thesis committee (consult with the faculty advisor), present a thesis proposal, complete the work outlined in the proposal, write a thesis, and defend it. The Masters thesis committee must contain at least three Penn State Graduate Faculty members, and at least two within the student's major field.

Integrated Undergraduate Graduate (IUG) Program

Scholars in the Schreyer Honors College who participate in the IUG program and wish to obtain their Masters degree in the Neuroscience Graduate Program must fulfill all Graduate School requirements noted in the Masters degree section above in addition to the following program-specific requirements. IUG students must demonstrate satisfactory performance on a neuroscience-related thesis project approved by the Neuroscience Graduate Program Director, and a minimum grade point average of 3.0 must be earned in the following core courses: Seminars in Neuroscience (NEURO 501- 4 credits), Comparative Neuroanatomy (NEURO 512 – 4 credits), Cellular and Molecular Neuroscience (NEURO 520 – 3 credits), Systems Neuroscience (NEURO 521 – 3 credits), Developmental Neurobiology (BIOL 426 - 3 credits), and Ethics in the Life Sciences (MCIBS 591 - 1 credit). The Schreyer IUG Plan of Study and Semester Reports should be reviewed with the Huck Graduate Programs Office to ensure all requirements will be fulfilled.

Governance of the Graduate Program in Neuroscience

The Neuroscience Graduate Program is governed by the Neuroscience Advisory Committee (2019-2020):

David Vandenberg, Ph.D., Chair; Professor, Biobehavioral Health;

Associate Director, Penn State Institute of the Neurosciences

Kevin D. Alloway, Ph.D., Professor, Neural and Behavioral Sciences, and Biology

Co-Director, Penn State Neuroscience Graduate Program

Paul Bartell, Ph.D., Associate Professor of Avian Biology

Victoria Braithwaite, Ph.D., Professor of Fisheries and Biology

Michele Diaz, Ph.D., Associate Professor of Psychology and Linguistics

Rick Gilmore, Ph.D., Associate Professor, Psychology

Ping Li, Ph.D., Professor of Psychology and Linguistics

Bernhard Luscher, Ph.D., Professor of Biology, Biochemistry and Molecular Biology, and Psychiatry

Robert Sainburg, Ph.D., Professor, Kinesiology and Neurology

Bruce Gluckman, Ph.D., Professor of Engineering Science and Mechanics, Neurosurgery, and Biomedical Engineering; Associate Director, Penn State Center for Neural Engineering

Appendix 1: Typical Course Timeline for Doctoral Students in the Neuroscience Curriculum for 2019-2020

University Park Campus
<i>Year 1 Fall</i>
NEURO 520 Cell & Molec. Neuroscience (3)
NEURO 512 Comparative Neuroanatomy (4)
NEURO 501 Seminars in Neuroscience (2)
Register for CITI on-line RCR course
Submit CITI RCR Course Completion Report
NEURO 596 Laboratory Rotations (1-3)
Electives
<i>Year 1 Spring</i>
NEURO 521 Systems Neuroscience (3)
NEURO 501 Seminars in Neuroscience (2)
Electives (3-4 credits)
NEURO 596 Laboratory Rotations (1 credit if needed)
Qualifying Examination: Summer

<i>Year 2 Fall</i>
NEURO 501 Seminars in Neuroscience (2)
BIOL 426 Developmental Neurobiology (3)
MCIBS 591 Ethics in the Life Sciences (1)
NEURO 600 Thesis Research (2)
Electives (2-4 credits)
<i>Year 2 Spring</i>
NEURO 501 Seminars in Neuroscience (2)
NEURO 600. Thesis Research (6)
Electives (2-4 credits)
Comprehensive Examination: Summer

<i>Years 3-5</i>
NEURO 601 Thesis Preparation
MCIBS 595 Internship (1) (optional)
Thesis Defense

Appendix 2: Core Courses in the Neuroscience Graduate Program

BIOL 426 Developmental Neurobiology (3 credits)

This course provides an overview of developmental processes as they apply to the central nervous systems. From initial differentiation of neural tissue to aging, this course covers contemporary topics in neuroscience including synaptogenesis, axon guidance, neural stem cells, apoptosis, learning and memory, and Alzheimer's disease.

MCIBS 591 Ethics in the Life Sciences (1 credit)

Students examine integrity and misconduct in life sciences research, including issues of data collection, publication, authorship, and peer review.

NEURO 501 Seminars in Neuroscience (2 credits)

This course examines the research presented by invited speakers in the Neuroscience Seminar series. It has two components: (1) student presentations of the general research questions, techniques, and conclusions in contemporary research articles from the speaker's laboratory, and (2) attendance of the research seminar by the invited speaker and participation in the question and answer periods.

NEURO 512 Comparative Neuroanatomy (4 credits)

This course provides instruction on the functional and structural organization of the vertebrate central nervous system. In addition to lectures, students attend laboratory sessions devoted to human brain dissections, histologic sections of various vertebrate brains, and non-invasive magnetic resonance images.

NEURO 520 Cellular and Molecular Neuroscience (3 credits)

This course provides fundamental instruction on the structural and functional organization of neurons and glia, how neurons and synapses develop and are modified by activity, and how neurons communicate electrically and chemically with each other.

NEURO 521 Systems Neuroscience (3 credits)

This pro-seminar course covers the mechanisms of specific neural systems and their relationship to behavior and cognition. The course is subdivided into blocks (2-3 weeks) that are devoted to a variety of topics such as motor control, cortical processing, and depression and anxiety, among others. Discussion of each topic is led by a faculty member who has expertise on that topic.

NEURO 596 Independent Study: Laboratory Rotations (1-3 credits)

For students exploring potential Ph.D. projects and faculty advisors. Students receive a R (satisfactory/passing) or F (unsatisfactory/failing). Only R credits are counted for credit totals.

NEURO 600 THESIS RESEARCH (up to 12 credits)

For students who are matched with a faculty advisor but have not passed their comprehensive exams. Work in this course is graded (A-F).

NEURO 601 THESIS PREPARATION (0 credits)

For students who have passed their comprehensive exams. This course appears on the transcript but does not have any grade or credit associated with it.

Appendix 3: Sample of Elective Courses for the Neuroscience Graduate Program*

BBH 502 Health: Biobehavioral Perspectives
BIOL 467 Neurological Disease
BIOL 479 General Endocrinology
BIOL 404 Cellular Mechanisms of Vertebrate Physiology
BMB 401 Biochemistry
BMB 598G Molecular Biology of Animal Development
ESC 555 Neuroscience Data Analysis
ESC 597F Introduction to Neural Engineering: Fundamentals of Interfacing with Brain
ESC 597A (PHYS 597A) Neural Control Engineering
KINES 565 Neurophysiological Basis of Movement
KINES 497 The Neurobiology of Motor Rehabilitation in Stroke
PSY 511 Foundations of Social, Cognitive, and Affective Neuroscience
STAT 500 Applied Statistics
STAT 501 Regression Methods
STAT 502 Analysis of variance and design of Experiments
STAT 507 Epidemiologic Research Methods
STAT 509 Design and Analysis of Clinical Trials
STAT 513 Theory of Statistics I
STAT 514 Theory of Statistics II
STAT 540 Statistical Computing
STAT 555 Statistical Analysis of Genomics Data

(*) These courses are examples of courses that previous students have taken as electives, and are not meant to be exclusive. Elective courses may include 400 and 500 level courses if approved by the Advisor AND the Co-Director of the Neuroscience Graduate Program.

Appendix 4: Guidelines for Advisor-Student Interactions

Effective mentoring, open communication, and ethical professional conduct are essential for a high quality graduate education and research environment. Effective mentoring must be based on a commitment to provide every student access to supportive guidance on a range of professional, ethical and collegial issues. A productive mentorship requires that students are treated respectfully and fairly, and that the mentor serves as a role model - upholding the highest ethical standards. These guidelines embody many of the best practices used by the majority of our faculty here and elsewhere. They are intended to provide a heightened awareness of the need to consciously establish an effectual mentorship based on trust, courtesy, and shared expectations.

Faculty Advisors/Mentors will:

- provide an environment that is intellectually stimulating, emotionally supportive, safe, and free of harassment;
- be supportive, equitable, accessible, encouraging, and respectful;
- recognize and respect the cultural back-grounds of students;
- be sensitive to the power imbalance in the student-advisor relationship;
- avoid assigning duties or activities that are outside students' academic responsibilities or are detrimental to the timely completion of their degrees;
- respect students needs to allocate their time among competing demands, while maintaining timely progress towards their degree;
- advise graduate students on the selection of a thesis topic with realistic prospects for successful completion within an appropriate time frame;
- assist students on selecting and forming a thesis committee;
- set clear expectations and goals for students regarding their research and thesis;
- discuss policies and expectations for work hours, vacation time and health contingencies;
- meet regularly and individually with students to provide feedback on research progress and expectations (weekly meetings are recommended);
- provide students with training and oversight in the design of research projects, development of necessary skills, use of rigorous research techniques, and all other aspects of research;
- arrange for the on-campus supervision and advisement of graduate students during extended absences as well as regular contact (e.g. by phone) when possible;
- provide and discuss clear criteria for authorship at the beginning of all collaborative projects;
- encourage participation in professional meetings and try to secure funding for such activities;
- provide career advice, help with interview and application preparation, and write letters of recommendation in a timely manner;
- ensure students receive training in the skills needed for a successful career in their discipline, including oral and written communication and grant preparation;
- schedule at least one meeting each semester to discuss topics other than research, like professional development, career objectives and opportunities, climate, laboratory personnel relations, etc;
- be a role model by acting in an ethical, professional, and courteous manner toward students, staff, and faculty.

Graduate Students will:

- acknowledge that they bear the primary responsibility for the successful completion of their degree;
- exercise the highest ethical standards in all aspects of their research, including collection, storage, analysis, and communication of research data;
- complete to the best of their abilities all tasks assigned by the program, including teaching duties;
- be informed about regulations and policies governing graduate studies at the program and graduate school levels and take responsibility for meeting program and graduate school deadlines;
- set up meetings with their mentor and communicate regularly with their thesis committees;
- prepare progress reports and request feedback from their full committee annually;
- be considerate of time constraints and other demands imposed on faculty and staff;
- take an active role in identifying and pursuing professional development opportunities;
- be proactive about improving their research skills, including written and oral presentation skills;
- inform faculty mentors of potential and or existing conflicts and work toward their resolution;
- seek mentoring and support resources beyond their faculty advisor, including other faculty mentors, peers, and organizations;
- consult outside help from graduate program chairs, ombudsmen, or other faculty if conflicts arise with your advisor;

- be aware that if they feel compelled to change advisors or research direction, they may have options and should consult with their program chair;
- always act in an ethical, professional, and courteous manner toward other students, staff, and faculty.

Programs will:

- provide students with information that includes policies, degree requirements, and resources;
- guide students through lab rotations (when applicable), assist students with selection of their advisor and resolution of student-advisor conflicts
- provide students with contacts and resources for potential conflict resolution in addition to the Program Chair (e.g. ombudsperson, director of graduate studies);
- provide pedagogical training and regular assessment of the teaching activities;
- monitor graduate student progress towards their degrees and professional development, including mentoring meetings, committee meetings, exam completions and other benchmarks appropriate to their discipline;
- provide and monitor training in the ethical conduct of research;
- provide appropriate infrastructure to allow students to complete their education and research in a timely and productive manner;
- establish and communicate policies for emergencies and unplanned situations that may disrupt the work of students and/or faculty;
- encourage and monitor student and faculty adherence to these guidelines.

These Guidelines are endorsed by the **Huck Institutes of the Life Sciences Graduate Education Office** and were adapted from guidelines recommended by the **Eberly College of Science Climate and Diversity Committee**.

