

## Neuroscience Graduate Program Requirements

Students in the Neuroscience Graduate Program (NGP) are advised by a Graduate Education Committee (GEC) member in the programmatic requirements and in the selection of courses for the first semester or until an Advisory Committee has been formed and coursework approved. All NGP PhD students have a common set of requirements: students must take a total of 60 semester credits, including 20 semester credits of courses (includes any course other than Dissertation and Research), which must include at least three 3-credit (or more) graduate courses at the 500 or 600 level. All NGP MS students also have a common set of requirements: students must take a total of 30 semester credits, including 20 semester credits of courses (includes any course other than Thesis and Research); at least half of the credits toward the degree must be at the 500 or 600 level. In addition to these common requirements, each option has its own prerequisites and suggested curricula (see below). PhD students who already have MS degrees in a related field may apply some of the MS coursework toward the PhD degree (as determined by the Advisory Committee). Students should be aware that additional coursework might be required at the discretion of the Advisory Committee. Furthermore, students must take:

- MS/PhD: Two credits of Professional Seminar (BCH/BIOM 594) or a seminar series course in another program as approved by the student's Advisory Committee. (An additional four credits in a seminar course can be counted toward PhD degree requirements.)
- MS: Two credits of Exp Molec Cell & Chemical Bio (BIOB 547).  
PhD: Four credits of Exp Molec Cell & Chemical Bio (BIOB 547).  
(Students are required to attend one of these "Data Club" courses, or a suitable alternative, throughout their tenure on campus.)
- MS: One credit of Introduction to Research (BCH/BIOM 570) for one lab rotation.  
PhD: Two credits of Introduction to Research (BCH/BIOM 570) for at least two lab rotations.

In addition to coursework, all PhD students must teach at least one semester (typically as a Graduate Teaching Assistant) and must rotate in at least two research laboratories. Students will typically be Graduate Teaching Assistants for Fall and Spring semesters of their first year, during rotations. The requirement for more than one research rotation can be waived by request of the GEC or Advisory Committee and by majority vote of approval from the NGP faculty if the student enters the doctoral program with a Master's degree or extensive prior research experience.

## MS Student Timeline

End of semester 1	Select Research Advisor and assemble Advisory Committee. In addition to the Research Advisor, the Advisory Committee must include at least three NGP faculty members and one outside faculty member. (Only tenure-track faculty, research-track faculty, current faculty affiliates, or faculty on adjunct appointment can serve as voting members.) If the Research Advisor is not primarily affiliated with NGP, then the Advisory Committee must include a NGP committee member to serve as the Academic Advisor and the Research Advisor is referred to as the Research Director.
End of semester 2	Advisory committee meets and approves curriculum. Any course waivers are documented and forwarded to the GEC. Complete any missing prerequisite coursework. Submit thesis research plan to Advisory Committee for approval. The research plan is a description of the work to be completed for the fulfillment of the research component of the MS degree (five pages).
End of semester 4	Complete coursework.
1 semester prior to graduation	Apply for graduation.
2 weeks before defense	Send thesis to Advisory Committee.
1 week before defense	Public notice of defense. Advisory Committee-approved draft sent to Dean of the Graduate School.
After passing defense	Signed Graduation Application to Graduate School.

## PhD Student Timeline

End of semester 2	<p>Select Research Advisor and assemble Advisory Committee. In addition to the Research Advisor, the Advisory Committee must include at least three NGP faculty members and one outside faculty member. (Only tenure-track faculty, research-track faculty, current faculty affiliates, or faculty on adjunct appointment can serve as voting members.) A research-track faculty member associated with the Research Advisor cannot serve as a voting member of the Advisory Committee. If the Research Advisor is not primarily affiliated with NGP, then the Advisory Committee must include a NGP committee member to serve as the Academic Advisor and the Research Advisor is referred to as the Research Director.</p> <p>Advisory Committee meets and approves curriculum.</p> <p>Any course waivers are documented and forwarded to the GEC.</p> <p>Complete any missing prerequisite coursework.</p>
End of semester 4	<p>Submit a preliminary dissertation research proposal to Advisory Committee. The preliminary research proposal should emphasize key questions and the experimental approach, and briefly state the specific aims (two pages).</p>
End of semester 5	<p>Pass the comprehensive examination (which consists of two parts: the written portion and the oral portion).</p>
End of semester 6	<p>Complete coursework.</p> <p>Submit final dissertation research proposal and schedule to Advisory Committee for approval and defend it in a public forum, such as Data Club. The dissertation research proposal is a description of the work completed, in progress, and to be completed for fulfilling the research component of the PhD degree. This research proposal serves as an informal contract that defines what must be completed before the student can apply for graduation (10 to 25 pages).</p>
1 semester prior to graduation	<p>Apply for graduation.</p>
2 weeks before defense	<p>Send thesis to Advisory Committee.</p>
1 week before defense	<p>Public notice of defense.</p> <p>Advisory Committee-approved draft sent to Dean of the Graduate School.</p>
After passing defense	<p>Signed Graduation Application to Graduate School.</p>

## **Comprehensive Exam**

The comprehensive exam includes a written portion and an oral portion. The written exam is either a research proposal or a set of written questions. The advisor and committee, together with the student, will determine which mechanism is used for the comprehensive exam. The Examination Committee will consist of the Examination Chair and the members of the Advisory Committee.

The written exam begins with the submission by the student of three abstracts (up to 500 words) to the committee, from which the committee will select one for development into a proposal. One of the abstracts may be for an “in field” proposal which is defined as a proposal that addresses neuroscience-related questions within their current area of expertise.

### **Out-of-field research proposal**

For this format, the student must write an outside, original research proposal, with the intent of focusing on a research problem and the approach required to address the problem. The topic will be outside of the student’s dissertation research. The following criteria will be applied by the Examination Committee to determine if the proposal topic is acceptable:

1. The system must be different than what the student is employing in the dissertation research.
2. The approach must be different from that which the student uses to pursue the dissertation problem.
3. The student will have to read literature not normally read for the dissertation research.
4. The out-of-field proposal must not be significantly similar to any proposal that the student has written for another purpose, such as an assignment for a course. Any appearance of overlap with a preexisting proposal must be declared and will be subject to approval by the Examination Committee.

### **In-field research proposal**

If the infield proposal abstract is selected by the committee then two additional provisions are applied: First, the Neuroscience GEC will appoint a substitute to replace the student’s advisor on the examining committee. The substitute will serve as the chair of the examining committee, other than the Research Advisor or Academic Advisor. The student’s Research Advisor or Academic Advisor can participate in the oral exam, but cannot vote and should not be present during the Examination Committee deliberation. Second, the student will be required to submit a fellowship proposal to an outside funding agency (with assistance from the advisor) at some later date, assuming both the written and oral exams are successfully completed.

### **Written portion of proposal**

The student will have five weeks from the time the topic is approved by the Committee to submit the research proposal. The student will follow the guidelines for preparing the research portion of either an NSF or NIH (R21) grant application and include a biosketch. The scope of the proposal should be limited to experiments that can be performed within two to three years and should be no more than 6 single-spaced pages plus references. Preliminary data can be utilized from published sources with proper citation. (Students following the NSF guidelines should neglect the Broader Impacts section.) The ideas and approach must belong to the student, but the student may consult with other people, but not Examination Committee members, about techniques.

The written examination will be submitted to the Examination Committee for their approval. The Examination Committee will have ten days to decide if the student has passed the written exam

and if the proposal is defensible. Each Examination Committee member will provide the student with a concise written critique. The student will pass with no more than one negative vote and will then schedule the oral examination within ten days. If the written exam is not satisfactory, the student should meet individually with each Examination Committee member to discuss possible improvements and resubmit the written exam a final time within three months.

### **Oral exam**

After passing the written exam, an oral exam will be scheduled within ten days. The oral exam, which will last no more than three hours, will be conducted by the Examination Committee to test the student's depth and breadth of knowledge in his or her field of study and cognate areas. The oral exam will consist of two parts:

1. Presentation of an overview of the proposal for the written comprehensive exam and a brief response to the Examination Committee members' written critiques (no longer than 20 minutes).

2. Defense of the student's proposal as well as examination of the depth and breadth of knowledge in the student's field of study and cognate areas, especially as it applies to the out-of-field proposal and the student's coursework. The student can be questioned on any topic that relates to the out-of-field proposal or completed coursework.

### **Comprehensive exam: written questions option**

For this format, the student must answer five written questions over a two-week period. Each member of the Examination Committee will submit a question designed to probe both the depth and breadth of knowledge in the student's field of study and cognate areas; the Examination Chair will coordinate the written exam and all members of the Examination Committee will have the opportunity to review the questions to ensure the exam is relevant and fair to the student. The written exam will take place over two consecutive weeks. The student may use all available resources, including those in print and online, but must develop and write the answer on their own without assistance from other scientists or trainees. Each answer is limited to 1500 words plus supporting references. The Examination Committee will have ten days to decide if the student has passed the written exam. Each Examination Committee member will provide the student with a concise written critique. The student will pass with no more than one negative vote and will then schedule the oral examination within ten days. If the student fails, they can take the written exam one more time within three months; the Examination Committee will decide if the entire exam or only a portion thereof is repeated.

The student will pass the written and oral portions with no more than one negative vote from Examination Committee. If the oral exam is not satisfactory, the student should meet individually with each Examination Committee member to discuss possible improvements. A second oral exam may be scheduled no sooner than one month and no later than three months after the first oral exam. An extension of the three-month limit may be made only by request of the Advisory Committee and by majority vote of approval from the NGP faculty. Upon successful completion of the comprehensive exam, and with the recommendation of the Examination Committee, the Examination Chair signs that the student has passed the Comprehensive Examination on the Graduation Application on file in the DBS office. The student becomes a PhD candidate upon successful completion of the comprehensive exam. Failure to pass either the written or oral portions of the comprehensive examination after a second attempt will result in removal of the student from the doctoral degree program.

## **Other requirements**

PhD students are required to rotate through at least two research laboratories and submit a report of the research to the NGP Graduate Education Chair after each rotation, signed by both the student and research advisor. The student must select and be accepted by a suitable Research Advisor by the end of their first semester (for MS students) or second semester (for PhD students) in order to ensure summer funding and continuation in the graduate program.

By the tenth week of the first rotation and the eighth week second rotation, the student and the faculty member should meet to discuss the possibility of the student pursuing their dissertation project in that laboratory. Both the faculty member and the student must inform the GEC the conclusion from this meeting: whether or not the student and faculty member both agree that the faculty member can serve as a Research Advisor to the student and work in their laboratory. If the first rotation does not result in a potential home by the tenth week, students will be strongly encouraged to begin a second rotation by the twelfth week of the semester, rather than waiting until the second semester.

## **Advisory Committee**

In consultation with the Research Advisor the student will identify an Advisory Committee whose role will be to:

- Ensure that the student understands all University, Graduate School and Department regulations. It is the student's responsibility to ensure these requirements are met.
- Offer advice and approve the student's Plan of Study.
- Offer advice and approve the dissertation topic and research proposal.
- Provide research advice as individuals and in regular (at least twice yearly) meetings of the full committee with the student. Students have the right to request a committee meeting at any time.
- Submit questions for the written qualifying exam and administers the oral qualifying exam.
- Review the completed dissertation and make recommendations for its revision.
- Conduct the final dissertation defense and certify to the Graduate School whether the student has passed/not passed this examination.

Students have the right to call Advisory Committee meetings at any time, but the student must meet with his or her Advisory Committee at least once every year. Until the time a research proposal has been approved by a student's Advisory Committee, replacement or resignation of committee members may be made without prejudice at any time at the request of the student and the research advisor, and with approval of the Graduate Education Committee.

The student must complete and submit to the Graduate Education Committee each January an annual evaluation that monitors progress in the graduate program and quality of teaching performance. Evidence of unsatisfactory progress for two years in succession or failure to address concerns of the Advisory Committee is grounds for academic probation or termination of the graduate assistantship.

## **Dissertation research proposal**

PhD students must submit a preliminary dissertation research proposal (about two pages) to the Advisory Committee that briefly states the specific aims and focuses on the key questions and

experimental approach before the end of the second year. The student must submit the final dissertation research proposal (10 to 25 pages including references) to the Advisory Committee before the end of the third year; the student must defend the research proposal in Data Club or a suitable public forum and the Advisory Committee will vote if it is acceptable. MS students must submit a thesis research plan (about five pages) to the Advisory Committee that describes specific aims and work to be completed before the end of the first year.

The student must maintain a GPA of 3.0 or higher for the curriculum approved by the Advisory Committee, or the student will be placed on academic probation. The student has one semester to raise the GPA to 3.0 or higher; failure to raise the GPA to a satisfactory level will result in removal from the graduate program.

The PhD student must write and defend a doctoral dissertation, which describes original scientific research performed by the student and developed by the student with input from the Research Advisor or Research Director. The Research Advisor or Academic Advisor along with the Advisory Committee determine the length and content of the dissertation. The PhD requires demonstrating proficiency in the scientific method, mastery of the current state of knowledge in the field of study, and a substantive new contribution to the body of either knowledge or methodology in the field of study. The student must demonstrate a rigorous comprehension of the principles and current techniques in the field of study, a thorough understanding of scientific data and error analyses, an appreciation of academic and scientific ethics, and a competence in scientific writing and presentation.

### **Non-thesis Master's degree option**

An optional non-thesis Master's degree is available to doctoral candidates. This degree does not replace the thesis Master's degree and is not available as an option to students matriculated in one of the Master's degree options or already holding a Master's degree in a related discipline.

Doctoral students may receive a non-thesis Master's degree upon fulfillment of all the following:

1. Completion of coursework.
2. Passing of the doctoral comprehensive examination.
3. Approval of doctoral dissertation research proposal by the Advisory Committee.
4. Approval of the NGP faculty by a majority vote.

### **Program Governance for Neuroscience Graduate Program**

Neuroscience Graduate Program (NGP) policies are interpreted by two committees: the Graduate Admissions Committee (GAC) and the Graduate Education Committee (GEC).

The charge of the GAC is to review and prioritize applications to the Neuroscience Graduate Program, coordinate recruitment efforts, coordinate incoming graduate student class size with NGP resources and other resources that may be available through the Associate Dean's office, recommend applicants for admission, and co-sign all offers of admission.

The Chair of the GEC acts as the initial coursework advisor for the first year of all students prior to the selection of a research advisor, oversees student progress in the Neuroscience Graduate Program for the duration of the degree, and conducts annual review of all student files.

It is the student's responsibility to contact the Chair of the GEC prior to scheduling major milestones such as the qualifying exam and dissertation defense. The Chair of the GEC and

the Program Director has the right to bring deficiencies to the attention of the advisory committee and all NGP faculty. If corrective action is deemed necessary, it will be referred to the Associate Dean's office.

## **NGP Course Requirements**

Graduate students typically register for 10 to 14 credits per semester during the first two years of the program when they are enrolled in academic courses. (A special exception is allowed for students who wish to obtain residency in Montana: please contact the Graduate School.) In later years, students register for a maximum of 9 credits of research, thesis, or dissertation each semester. Graduate students must enroll for at least 9 credits in the Fall and Spring semesters in order to receive stipend support. Graduate students should not enroll for more than 9 credits in any semester in which they are enrolled in Research/Thesis/Dissertation courses (597, 599, 697, or 699).

Students do not need to enroll during Summer session except if they expect to defend during that session. Students who complete the requirements for the Ph.D. during summer session must enroll for 1-3 credits of Dissertation during summer session. Students who miss the deadline for completion of degree requirements at the end of a semester and will defend early in the next semester may register for 3 credits of Dissertation for that semester. If the student continues to receive a stipend, this requires prior approval of the Graduate School. Students on stipend who defend later in the term must enroll for 9 credits.

Program curriculum is flexible and coursework is completed during the first two years of the doctoral program to allow for maximum time spent working on research in the student's selected advisor's laboratory.

Students are accepted into the graduate program for admission during fall terms and typically arrive in Missoula during July and August. Those arriving early can take advantage of the beautiful Missoula summer and can carry out one or more laboratory rotations.

Courses start at the end of August each year, with general coursework and research rotations the focus in year one. Prior to selection of a research advisor, the Graduate Education Committee will advise first year students. At the end of the first year, students are expected to select an advisor in whose lab they will work to conduct independent research towards a dissertation throughout their tenure in the program. The Research Advisor serves as a mentor to the student and assists the student in assuring that all deadlines and procedures are followed.

Before the start of the third semester, students must select an advisory committee. Through discussion and mutual agreement, the student and research advisor select an area of interest and other faculty members to serve on the advisory committee. The advisory committee is comprised of a minimum of five members, at least four of who are full time faculty or adjuncts in the Neuroscience Graduate Program (NGP), and one from outside the NGP. The student is responsible for approaching these faculty members to request service on the Advisory Committee. After completing the Advisory Committee Form, the student submits the form to the Graduate Education Committee, who forwards it to the Associate Dean's Office in the Division of Biological Sciences. Once approved, by the college, the form is submitted to the Dean of Graduate Studies for the University of Montana for final approval. In addition to selection of the Advisory Committee, students must prepare a plan of study that includes all courses to be taken. The plan of study must subsequently be endorsed by the Advisory Committee. Any changes in the plan of study, once approved, require approval of the Advisor and Advisory Committee.



At the beginning of the third year, students must complete the comprehensive qualifying exam as described above. This exam includes both a written component and an oral portion that evaluates the candidate's general knowledge of neuroscience and related disciplines, and their ability to apply that knowledge in the research setting and in written and oral communication of research and scientific ideas.

A dissertation research proposal should be completed and endorsed by the Advisory Committee no later than the middle of the fifth semester in attendance. A research progress seminar should also be presented during the third year. Students will spend their remaining time in the program conducting research to assemble a written doctoral dissertation, completing the program with the doctoral dissertation defense.

### **Required Courses**

- NEUR 661: Neurosciences I (4 cr.)
- NEUR 662: Neurosciences II (4 cr.)
- BCH 600: Cell Organization and Mechanisms (3 cr.)
- BMED 609: Biomedical Statistics (3 cr.)
- NEUR 582: Research Seminar Neuroscience (1 cr.)
- BCH 547: Exptl Mol/Cell/Chem Biol (1 cr.; Data Club)
- BIOB 594: Professional Seminar (1 cr.)
- BMED 605: Biomedical Research Ethics (1 cr.)
- BCH 570: Intro to Research (Research Laboratory Rotations; 3 cr.)
- BIOB 597: Research (variable credits during research under chosen advisor) \*
- BIOB 599: Thesis (for *graduating* M.S. students)
- BIOB 699: Dissertation (for *graduating* Ph.D. students)

Students without preparation in biochemistry must take BIOC 480/482 as a pre-requisite to BMED 600.

\* A minimum of 20 credits is required by the Department for the Ph.D. degree.

A maximum of 30 credits may be applied toward the 60-credit requirement for the Ph.D.

### **Electives**

Ph.D. students will take at least three of the following courses, according to research interest.

### **Neuroscience Courses**

- NEUR 610: Neuropharmacology (3 cr.)
- NEUR 646: Neurotoxicology (3 cr.)
- BMED 667: Topics in Neurobiology (3 cr.)

### **Other Elective Courses**

- BMED 615: Molecular Pharmacology (3 cr.)
- BCH 581: Physical Biochemistry (3 cr.)

- BCH 582: Proteins and Enzymes (3 cr.)
- BIOM 535: Advanced Virology (3 cr.)
- BIOM 502: Advanced Immunology (3 cr.)
- BIOB 509: Principles of Light Microscopy (3 cr.)
- BIOB 567: Molecular Mechanisms of Development
- BCH 694: Biochemistry & Biophysics Seminar

### **Additional Courses**

Additional Courses are available through other departments. Use the [Course Search](#), choosing term and subject (e.g., BCH, BIOB, BIOM, BMED, NEUR) and consulting the [Course Descriptions of the University of Montana Catalog](#).

### **Graduate Academic Courses**

Many graduate academic courses are offered every other year.

#### ***Courses offered Autumn Semester (odd years)***

- BCH 584: Nucleic Acids (3 cr.)

#### ***Courses offered Autumn Semester (even years)***

- BCH 582: Proteins and Enzymes (3 cr.)

#### ***Courses offered Spring Semester (odd years)***

- BCH 581: Physical Biochemistry (3 cr.)
- BIOB 509: Principles of Light Microscopy (3 cr.)

#### ***Courses offered Spring Semester (even years)***

- BIOM 502: Advanced Immunology (3 cr.)
- BCH 600: Cell Organization and Mechanisms (3 cr.)
- BIOB 567: Molecular Mechanisms of Development

### **Graduate School Requirements**

**Degree Guidelines** may be found on the [Graduate School Page](#).