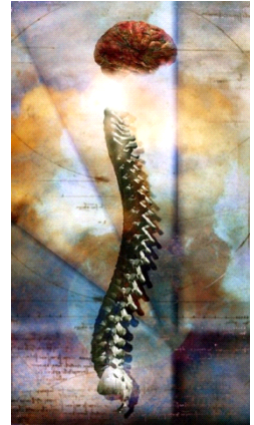




Graduate Program in Neuroscience

Clinical Sciences North, MC526 – Suite 300 CSN
Tel. (312) 996-7370 – Fax (312) 413-8221 - www.uic.edu/depts/neurosci



Graduate Program in Neuroscience - Curricular Program Details; Proposed, Revised August, 2008

The Ph.D. in Neuroscience follows the curricular guidelines established by the Graduate College of the University of Illinois at Chicago. A total of 96 credit hours is required for graduation. Of these 96 hours, 32 will be obtained from formal graded courses (not including research and NEUS 595 Seminar in Neuroscience; i.e. Journal Club). These constitute the “GPA” credit hours. A minimum of 8 GPA hours at the 500 level (not including core courses GCLS 503, NEUS 501 and 502) must be obtained by all students, whether or not they enter the program with a Masters of Science degree. These 8 credit hours are included within the 32 hours of course work required for the degree. All graduate trainees will take a first year of core courses in biology and neuroscience, as well as rotations through laboratories in participating departments that will begin in the first semester. Before starting their second year, students will choose their thesis advisor. At the end of their second year, students will take a Preliminary Examination before continuing their dissertation research.

First Year Core:

Students are expected to register for a minimum of 12 hours credit each semester (not to exceed 16 credit hours). During the first semester all students will be required to take:

Course Number	Course Name	Credits
GCLS 503	Cell Biology	3
NEUS 501	Foundations of Neuroscience I	3
NEUS 506	Research Rotations	3-6
	Elective chosen from courses listed under Second year core	2-3
NEUS 595	Seminar in Neuroscience	1

Students who enter the program without a foundation in Biochemistry (3-4 credit hours at the 300 level) or General/Organic Chemistry may be asked to take GCLS 501 Biochemistry their first semester in lieu of an elective.

During the second semester, students will be required to take:

Course Number	Course Name	Credits
NEUS 403	<i>either</i> Human Neuroanatomy	3
BioS/NEUS/PSCH 483	<i>or</i> Mammalian Neuroanatomy	4
NEUS 502	Foundations of Neuroscience II	3
NEUS 506	Research rotations	3-6
	Elective chosen from courses listed under Second year core	2-3
NEUS 595	Seminar in Neuroscience	1

During the summer semester of their first year, students will complete their research rotations (students on fellowships will register for 6 hours of NEUS 506 during the summer) and select a thesis research advisor before the start of the Fall semester.

Second Year Core: In their second year, students, in consultation with their thesis advisor, will take elective courses that may focus on one of the three defined concentrations:

1. Neural signal transduction and molecular biology
2. Systems & integrative neuroscience
3. Human/ therapeutic neuroscience and methods of neural imaging

The following list of courses, while representative of the three concentrations, are not exhaustive and would be expected to change over time. It is not guaranteed that these courses will be offered every year. It would be expected that students take at least three courses in their area of research specialization, but every effort will be made to provide a flexible curricular experience for the students. When registering for graduation, you will have the option of applying for a concentration in one of these three areas.

Concentration 1
Neural signal transduction and molecular biology

Course Number	Course Name	Credits
GCLS 501	Biochemistry	3
GCLS 502	Molecular Biology	3
GCLS 515	Receptor Pharmacology and Cell Signaling	3
BIOE 440	Biological Signal Analysis	4
BIOE 472	Models of the Nervous System	4
BIOS 489	Cellular Neurobiology Laboratory	3
BIOS 586	Cell & Molecular Neurobiology	3
NEUS 561	Current Topics in Visual Neuroscience	2
PCOL 540	Ion Channels: Structure, Function, Pharm and Path	2
PHYB 569	Methods in Experimental Physiology	3
PHYB 592	Tactics and strategy of research in Physiology	2

Concentration 2
Systems & integrative neuroscience

Course Number	Course Name	Credits
ANAT 520	Concepts of Synaptic Function and Morphology	2
ANAT 521	Plasticity in the Nervous System	2
ANAT/BIOS 527	Cellular and Systems Neurobiology	3
ANAT 554	Neuroendocrinology	2
BIOE 440	Biological Signal Analysis	4
BIOE 465	Metabolic Engineering	4
BIOE 475	Neural Engineering I: Introduction to Hybrid Neural Systems	4
BIOE 476	Neural Engineering I Laboratory	2
BIOE 575	Neural Engineering II - Neural Coding	4
BIOS 486	Animal Behavior & Neuroethology	4
GCLS 500	Physiology	3
NEUS 561	Current Topics in Visual Neuroscience	2
PSCH 465	Neural Basis of Perception	3
PSCH 462	Neural Basis of Learning and Memory	3
PSCH 466	Neural Basis of Motivation	3

Concentration 3
Human/ therapeutic neuroscience and methods of neural imaging

Course Number	Course Name	Credits
ANAT/NEUS 525	Molecular and Cellular Mechanisms of Neurodegenerative Disease	2
BIOE 421	Biomedical Imaging	4
BIOE 576	Sensory Prosthesis Engineering	4
BIOE 579	Neural and Neuromuscular Prostheses	4
MVSC 472	Movement Neuroscience	3
NEUS 511	Biomedical Neuroscience I	2
NEUS 512	Biomedical Neuroscience II	2
NEUS 561	Current Topics in Visual Neuroscience	2
NEUS 588	Human Neuroscience: Functional Magnetic Resonance Imaging	3
PCOL 540	Ion Channels: Structure, Function, Pharmacology, and Pathology	2
PSCH 564	Clinical Psychopharmacology	3

In their second year, it is recommended that students take two modules of Research Methods (GCLS 504 and GCLS 505) or other methods-based courses (see list below) for at least 2 credit hours which will count toward their total elective credit.

GCLS 504 Research Methods I, First Semester -

- Module I - Separation Methods (Chromatography, Electrophoresis, Mass Spectrometry)
- Module II - Molecular Biology Techniques and Discovery Bioinformatics
- Module III - Spectroscopic and Structural Biology Methods

GCLS 505 Research Methods II, Second Semester -

- Module IV - Cell Physiology and Imaging Methods
- Module V - Advanced Molecular Genetics Methods
- Module VI - Biochemical and Chemical Methods
- Module VII - Immunological Methods

Other courses that can fulfill these recommendations include:

BioS 489	Cellular Neurobiology Laboratory
BioS/NEUS 582	Methods in Modern Neuroscience
NEUS 588	Human Neuroscience: Functional Magnetic Resonance Imaging

as well as 400 level courses in Bioengineering for those students following that track.

Students will be required to take a statistics course that is appropriate for their research concentration and dissertation work. Courses appropriate to specific programs of study such as Bioengineering or Psychology can be recommended in consultation with each student's thesis advisor or the Director of Graduate Studies.

Each semester, students will be required to register for and participate in **NEUS 595**, Seminar in Neuroscience (i.e. the Neuroscience Program Journal Club). This seminar will allow Neuroscience students to come together as a group on a weekly basis to listen to and interact with invited speakers as well as to present and lead discussions on timely research topics. A grade of satisfactory/unsatisfactory will be given.

Students will also be expected to register and participate in 0 credit hour course in research ethics (**GC 401**) and the use of animals in research (**GC 470**) as required by the Graduate College and the National Institutes of Health.

Starting in their second year, students will register for NEUS 599, thesis research, to complete the 96 required credit hours.

Evaluation of Student Progress

First Year Progress: During their first year, students will experience a rigorous program comprised of both formal course work and laboratory experiences. Successful completion of both educational experiences is required for advancement.

Competency in formal courses will be evaluated by written tests and oral presentations on assigned topics. Thus, successful completion of the first year and progression to the second year of study will first be contingent upon the student **(1) keeping in good academic standing**. Graduate students in the Neuroscience Program are considered to be in good standing during their first year if they have a minimum graduate grade point average of 3.0 (A = 4.0).

Second, students must obtain satisfactory evaluations by faculty advisors during their research rotations. Students will be guided by the Director of Graduate Studies to experiences that represent the different areas of concentration in Neuroscience program. Competency in research will be evaluated by the research advisor in consultation with the Director of Graduate Study. At the end of the Fall and Spring semesters, first year students will be required to present Research Rotation talks. First year students will be asked to give a short presentation on their research experiences and respond to question from the faculty and their peers. This will serve as an additional opportunity for evaluation of the students' ability to conceptualize information and express their understanding of that information. First year students will have additional opportunities to practice making presentations and integrating material across the several concentrations by participating in Journal Club with their fellow students. This experience will bring together all of the Neuroscience students to discuss not only their own research but critical topics in the Neuroscience literature that spans the multiple concentrations. All students will be expected to lead discussion on various topics and receive feedback from participating faculty and peers.

Thus, successful completion of the first year and progression to the second year of study will also be contingent upon the student **(2) demonstrating progress in developing research skills as determined by faculty evaluation** and ultimately **(3) securing a thesis advisor who will agree to support the student through research or other funding sources available to the advisor** (which could include training grants, foundation or National Research Service Awards, Departmental Teaching or Research Assistantships, etc.). **In the event that a student's GPA falls below 3.00 and/or the student has not secured a thesis advisor who is able to arrange for his/her continued support by the end of the Summer semester of the first year, that student will not be allowed to continue in the Program.**

Second Year Progress: During the second year, students will continue their elective course work in their chosen concentration and begin research in the laboratory of their chosen thesis advisor. In general, the same assessment standards used in the first year will be applied during the second year, which includes the maintenance of a 3.0 GPA and

satisfactory progress in the laboratory as evaluated by the thesis advisor in consultation with the Director(s) of Graduate Study. Students will maintain a continued exposure to the integrative aspects of the program through their required participation in Journal Club, their participation in the Annual Graduate Student Symposium each Spring and their attendance at required seminars and special lectures.

A **Preliminary Examination** will be required before starting the third year. The preliminary exam allows a student to pass to Ph.D. candidacy. The student and program “concentration” director assemble a committee comprised of a minimum of five program members with varied interest in Neuroscience. No more than three members of this committee can come from the home Department of the student’s thesis advisor; at least two must be tenured faculty; three must be full members of the Graduate College and all must be approved by the Graduate College to serve as examiners. The student’s advisor is not a member of the exam committee; thus, a “procedural” chair must be selected from the five examiners to insure the timely and appropriate administration of the exam.

The Preliminary Examination will consist of: (1) a written research proposal in NRSA format that will be reviewed by the examination committee prior to the formal examination - this proposal will form the basis of the oral examination; and (2) an oral defense and examination before the students committee. Students will be permitted to submit their thesis proposal as the written part of their Preliminary Examination requirement. However, if it is the custom of the advisor’s home Department to use a different format for the proposal, e.g. a proposal on a topic different from the student’s dissertation, we will defer to the Departmental tradition. It is the responsibility of the Examination Committee in consult with the thesis advisor to specify in writing the format of the proposal in a timely manner to the student and the Director of Graduate Studies. The proposal will be written in NRSA grant format to allow the student to submit the proposal to an appropriate funding agency. The committee can provide feedback to the student while preparing the written proposal. The committee must accept the proposal as showing sufficient intellectual independence and scientific quality before allowing the student to move on to the oral examination.

While the initial focus of the oral examination will be on the written proposal, the committee should probe the breadth and depth of the student’s knowledge beyond what is presented in the proposal; i.e., committee members ask questions that can be related to the proposal or to other aspects of Neuroscience. The experience allows the student to take what he or she has learned in formal course work and apply that knowledge to formulate research questions from both methodological and primary literature review stand points. It also prepares a student to deliver a lecture and to defend a scientific position. The student’s advisor can be present at the oral examination but cannot participate in the discussions. A vote of more than one failure by committee members will constitute a failure of the examination. Successful remediation of the failure must be accomplished by the end of the third year of study. Failure to remediate will result in dismissal from the Graduate College.

Continued Requirements: Following successful completion of the Preliminary examination, students will formally begin their dissertation research. By the end of their third year, students will be required to select a dissertation advisory committee of a minimum of five members. It is expected that this advisory committee will be the dissertation examination committee; however, it is reasonable for either the student or advisor to invite other faculty or technical experts to join the group to provide specific advice and expertise as needed.

The dissertation committee is ultimately appointed by the Dean of the Graduate College on the recommendation of the Program. The committee can include the thesis advisor – no more than three members of the committee can come from the home Department of the student’s thesis advisor; it is recommended that one member must be from outside the University¹. A procedural chair will be selected; the chair must be a full member of the Graduate College. At least two members of the committee must be tenured faculty at UIC; two must be full members of the Graduate College. The student is required to meet with the committee at least once each year in the Spring in conjunction with the student’s presentation at the Annual Graduate Student Symposium. The committee will serve in an advisory role and will work with the advisor to evaluate student progress and ultimately determine when the student is ready to write and defend his/her dissertation. The committee will be asked to submit a Progress Report to the Director of Graduate Studies each year to certify that they have met with the student. Students will maintain a continued exposure to the integrative aspects of the program through their required participation in Journal Club, their participation in the Annual Graduate Student Symposium each Spring and their attendance at required seminars and special lectures.

Final Graduation Requirements: Upon the approval of their dissertation advisory committee, students can complete their dissertation and prepare their defense. A written dissertation and oral defense before their Dissertation Committee as defined and approved by the Graduate College will be required. Students will also be required to offer a final formal public seminar in partial fulfillment of their graduation requirements.

The **Graduate Studies Committee** will represent the Program and serve as an intermediary between the students, Director of Graduate Study and Program Directors. This panel of experts will be positioned to assess and promote the quality of the educational program (both formal course work and informal exercises) and maintain the highest standards of excellence. They will review all students’ evaluations on a yearly basis and intervene and advise when problems or conflicts arise. Given the subjective nature of the evaluation process, especially when it involves research critical to an individual investigator’s program, it is critically important to rely on an independent and

¹Graduate College Rules require that at least one member of the dissertation committee “must be from outside the degree-granting program, which may include graduate faculty from other UIC departments or Colleges.” Of course this rule was written when all Graduate Programs were housed intra-departmentally. The Graduate College now agrees that due to the multidisciplinary nature of the Program that inclusion of examiners from “outside” the home Department of the advisor is appropriate. It is still recommended that one examiner be from outside the University.

knowledgeable body of peers to insure the fair and impartial evaluation of student progress.

M.D. Ph.D. Students: . M.D. Ph.D. students in the College of Medicine will be welcomed to the Neuroscience Program. In general, M.D. Ph.D. students are required to meet all the requirements of the Graduate Program as defined for the Ph.D. students. Nevertheless, the Director of Graduate Studies will work closely with the students and their advisors to design a program that best suits the needs and talents of the individual students.

Normally, students will begin their course work with the first two years of the Medical School curriculum. They are required to complete their laboratory rotations during these first two years. Beyond that, a minimum of 8 GPA credit hours at the 500 level (not including core courses GCLS 503, NEUS 501 and 502) must be obtained by all students. NEUS 501 Foundations of Neuroscience I is required and the credits do not count toward the elective credits. The requirement for NEUS 403 Human Neuroanatomy and NEUS 502 Foundations of Neuroscience II are waived since equivalent content courses are taken during the M1 year. GCLS 503 Cell Biology is recommended but the requirement can be waived if requested by the student and his/her advisor after review by the Director of Graduate Studies. Electives (500 level courses) and the Ph.D. Preliminary Examination should be completed by the end of the third year (first year as graduate student) as described for the Ph.D. candidates. Upon completing their preliminary examination, M.D. Ph.D. students are required to meet with their dissertation/advisory committee (as described for the Ph.D. candidates) every six months and are required to participate in Journal Club (NEUS 595) and the Spring Graduate Student Symposium. Final graduation requirements for the Ph.D. are the same as those required for the Graduate Students. M.D. Ph.D. students must successfully complete and defend their dissertation before resuming their professional medical training.

Connections to Postdoctoral Trainees and Medical Residents: Clearly, the major focus of the Neuroscience program will be research intensive training of Ph.D. and M.D./Ph.D. students. We expect the training environment to be one in which doctoral students interact also with postdoctoral trainees as well as Medical Residents. This will enrich the experience for all groups.