



HANDBOOK
OF
GRADUATE STUDIES IN NEUROSCIENCE
GRADUATE SCHOOL OF BIOMEDICAL SCIENCES
THE UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER
AT
SAN ANTONIO, TEXAS

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Distribution – New Graduate Students, COGS, and New Faculty

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PROGRAM OVERVIEW

The graduate program leading to the Ph.D. degree in Neuroscience is designed to provide the strong background in research methodology and experimental design necessary for a professional career in academia, industry, or governmental service. Generally five years are required to complete the requirements for the Ph.D.

Students are expected to complete the required course work and complete the qualifying examination for the Ph.D. by the summer session of their second year. Following successful completion of all required courses and the qualifying examination and satisfactory research progress, students are admitted to candidacy for the Ph.D. During the third year, students are expected to develop a dissertation research proposal and present it in a formal seminar. Students are also encouraged to make presentations of their research data at national scientific meetings.

Disclaimer

The provisions of this Handbook do not constitute a contract, expressed or implied, between any applicant, student, or faculty member and the Neuroscience Training Program, the Graduate School of Biomedical Sciences, The University of Texas Health Science Center at San Antonio, or The University of Texas System. The Neuroscience Training Program reserves the right to alter course offerings at any time or to change the curriculum or any other procedures leading to the awarding of a degree and any other requirements affecting students. Changes will become effective whenever the proper authorities so determine. The changes will apply to prospective students and may apply to those already enrolled.

Revisions

Recommendations for improving the content of this handbook are welcomed from the students and any members of the faculty of the Neuroscience Training Program.

Abbreviations and Definitions Used in this Publication

COGS	Committee on Graduate Studies of the Department of Pharmacology
Dean	Dean of the Graduate School of Biomedical Sciences
Faculty	Unless noted otherwise, Graduate Faculty of the Neuroscience Training Program
GFC	Graduate Faculty Council
GSBS	Graduate School of Biomedical Sciences
IMGP	Integrated Multidisciplinary Graduate Program
SOC	Student Oversight Committee (Neuroscience Training Program)
UTHSCSA	The University of Texas Health Science Center at San Antonio

ACADEMIC STANDARDS

Students pursuing graduate studies in neuroscience are expected to maintain a Satisfactory (S) grade in Seminar, Research, Dissertation, Supervised Teaching, and Special Topics and at least a letter grade of B in all of their graduate courses.

GSBS guidelines state that a student must maintain a cumulative GPA of 3.0. A student, whose cumulative GPA falls below 3.0, is automatically placed on probation by the Dean and warned that continuation in the graduate program is in jeopardy. While on probation, the student must maintain at least a 'B' average in all subsequent semesters for which he or she is registered. Failure to achieve a 3.0 in the course work for any semester could result in the student being considered for dismissal from the Graduate School by the COGS and/or the Dean. A student will remain on probation as long as the cumulative GPA remains below 3.0. A student may not withdraw from any courses while on academic probation. Students on probation are not eligible for Ph.D. candidacy.

If a letter grade of C or U is received in any neuroscience course, the student will be referred to the SOC for consideration. Generally, the student will be required to repeat the course. A letter grade of C in two or more graduate courses or a letter grade of D in any graduate course could result in the SOC recommending that the student be dismissed from the graduate program. The SOC will decide on the appropriate course of action following a review of each case. All actions of the SOC are subject to administrative approval by COGS.

Appeal Process

A student may appeal to the SOC to reconsider any policy decision that may affect the student's progress or tenure in the Neuroscience Training Program. In those cases where dismissal is recommended to the Dean, the appeal process will be directed by the Dean's Office. All actions short of dismissal will be appealed to COGS.

COURSE WORK AND LABORATORY ROTATIONS

Required Courses

All students enrolled in the Ph.D. program in Neuroscience are required to take the following courses:

CSBL 5095	Experimental Design & Data Analysis (Statistics)
INTD 5000	Fundamentals of Biomedical Sciences
INTD 5008	IMGP Laboratory Rotations

INTD 5040	Fundamentals of Neuroscience I: Molecular, Cellular, & Developmental
INTD 5043	Fundamentals of Neuroscience II: Systems
INTD 5047	Neuroanatomy
INTD 6090 NS	Neuroscience Seminar
INTD 6002	Ethics in Scientific Research
INTD 6071 NS	Supervised Teaching
INTD 6097 NS	Research
INTD 7099 NS	Dissertation (2 semesters required)
PHAR 5092	Research Practicum
-----	Electives (minimum of 4 credits)

Exemptions

An exemption from any of the courses listed above may be requested if the student has taken similar courses and received at least a letter grade of 'B'. The student should petition the SOC as soon as possible after admission to the graduate program for exemption from a given course.

TYPICAL COURSE SCHEDULE FOR THE FIRST TWO YEARS

Fall Semester First Year

Course Number	Course Title	Credit Hours
INTD 5000	Fundamentals of Biomedical Sciences	8.0
INTD 5008	IMGP Laboratory Rotations (2)	2.0
	TOTAL	10.0

Spring Semester First Year

Course Number	Course Title	Credit Hours
INTD 5008	IMGP Laboratory Rotations	2.0
INTD 5040	Fund. of Neuroscience I: Molecular, Cellular, Dev.	3.0
INTD 6002	Ethics in Research	0.5
-----	Elective(s)	----
INTD 6090 NS	Neuroscience Seminar	1.0
	TOTAL	9.0+

Selection of the Supervising Professor

Students are encouraged to select a faculty member who will serve as the Supervising Professor for his/her dissertation research after completing the required IMG P lab rotations. For the Neuroscience Training Program, this faculty member must be a member of the Neuroscience graduate faculty.

The student is required to obtain approval from the SOC and COGS for the proposed dissertation supervisor. The faculty member must have an active research lab, be willing to serve as the student's dissertation supervisor and must have funds to support the student's stipend and research activities for the entire time required to complete the dissertation research project (usually 3 years). The SOC and COGS will not approve a faculty member as a dissertation supervisor who does not have funds to support the student's research and stipend and/or who has not been approved as a credentialed member of the graduate faculty.

Summer Semester First Year

Course Number	Course Title	Credit Hours
-----	Elective(s)	----
INTD 6097 NS	Research	----
PHAR 5092	Research Practicum	1.0
	TOTAL	6.0

Fall Semester Second Year

Course Number	Course Title	Credit Hours
CSBL 5095	Experimental Design and Data Analysis	2.0
INTD 5043	Fund. of Neuroscience II: Systems	3.5
INTD 5047	Neuroanatomy	2.0
INTD 6090 NS	Neuroscience Seminar	1.0
INTD 6097 NS	Research	0.5
	TOTAL	9.0

Spring Semester Second Year

Course Number	Course Title	Credit Hours
INTD 6090 NS	Neuroscience Seminar	1.0
INTD 6097 NS	Research	---
-----	Electives	---
QUALIFYING EXAM		
		TOTAL 9.0

Summer Semester Second Year

Course Number	Course Title	Credit Hours
INTD 6097 NS	Research	6.0
QUALIFYING EXAM (see pages 11-18 for details)		
		TOTAL 6.0

RESEARCH PRACTICUM

Students must complete one research practicum. This is a full-semester research experience during the summer following the first year. Successful completion of the research practicum is a requirement for admission into candidacy. A report by the principal investigator that the student has clearly demonstrated the potential for productive and independent investigation will be a requirement for admission into candidacy.

At the beginning of the research practicum, the principal investigator will discuss the criteria (below) that will be used to evaluate the performance of the student during the laboratory rotation. The Academic Programs Manager will provide a written copy to all students at the beginning of the practicum.

Students are required to write a report and to present a 15-minute talk to the faculty and students in the Neuroscience Training Program following the completion of the research practicum. Students are encouraged to work with the principal investigator who will assist them in the preparation and organization of the oral presentation.

At the end of the research practicum, students will write a short report (about 10 double-spaced, typewritten pages) in journal style (i.e. Introduction, Methods, Results and Discussion). One copy of the report is given to the laboratory supervisor for evaluation and grading (see below), and a second copy is given to the Academic Programs Manager to serve as a file copy.

The principal investigator must be selected from the Graduate Faculty of the Neuroscience Training Program who have active research laboratories.

Research Practicum Project Criteria

a. The Objective

The objective of the research practicum is two-fold:

1. To give students an opportunity to develop research skills and aid them in selecting a laboratory in which to pursue their dissertation research.
2. To permit faculty to evaluate the laboratory skills and potential research aptitude of the student.

b. The Project

The design of the research project is the responsibility of the principal investigator and should be done prior to accepting a student in the laboratory. It is critical that the principal investigator develop a concise and well-defined project for the student. The project should satisfy the following criteria:

1. The project should be hypothesis-driven.
2. The methodology required to complete the project should currently be in use in the laboratory.
3. There should be a reasonable expectation of some success within the allotted time.

c. The Evaluation

The student will be evaluated on the following criteria:

1. Technical competence
2. Motivation and dedication of time and effort
3. Understanding of the techniques and instrumentation used in the research
4. Understanding of scientific concepts and principles pertinent to the project
5. Ability to read and critically evaluate literature
6. Ability to work, think, and write independently

The principal investigator should meet regularly with the student to discuss the student's performance based on the above criteria. At the end of the research practicum, an evaluation form will be sent to the principal investigator, who will give the student an A (excellent), B (average) or C (unsatisfactory) grade for each criterion.

The principal investigator must meet with the student to discuss the evaluation and have the student sign the evaluation form to indicate that he/she has had the opportunity to

review and discuss the evaluation with the mentor. The evaluation is then submitted to the Academic Programs Manager to be reviewed by the SOC. These evaluations are then placed in the student's file and are available for review by the faculty.

d. The Written Report

The report is to be given to the principal investigator before the end of the semester. The written report is to follow the format of a short research communication (about 10, double-spaced, typewritten pages) consisting of the following parts:

1. Introduction
2. Methods
3. Experimental Results
4. Discussion
5. Summary and Conclusions
6. References (no more than 10 – 12 references)

e. The Post-Practicum Talk:

Students are required to give a brief (approximately 15 minutes) post-practicum talk to the members of the Neuroscience Training Program on the research project that should state the hypothesis tested, cite specific objectives, give a brief discussion of the methodology employed, and summarize the results obtained in the study. Among those in attendance, members of the neuroscience program will be asked to complete Seminar Speaker Critique forms to provide constructive criticism to the speakers. In addition, the presentations will be video-taped on DVD. The DVD will be provided to the principal investigator for him/her to review and discuss with the student. The critique forms should also be reviewed and discussed.

f. The Grade:

Students receive a letter grade for the Research Practicum that is based equally upon the evaluation of the student's performance in the laboratory (50%) and on the written report (50%).

REGISTRATION

The Registrar's Office will notify students via e-mail of the dates open for web-based registration. Prior to registering, students should obtain any necessary permit numbers from the Academic Programs Manager.

To be enrolled as a full-time student for the fall and spring semesters, students must register for a minimum of 9 credit hours; for the summer semester, students must register for a minimum of 6 credit hours.

At the time of registration for each semester, students should also submit a UTHSCSA Health Insurance Coverage Information form to the Registrar's Office to show proof of health insurance coverage.

Registering for Final Credit Hours

A student may register for final credit hours during the semester or summer session he/she plans on defending her/his dissertation. A student registering for final hours is exempt from the minimum tuition requirement and only required to pay tuition for 3 credit hours. International students must obtain permission from the Office of International Services (OIS) **before** registering for less than a full course load by submitting the Request for Authorization to Reduce Course Load form.

THE PH.D. QUALIFYING EXAMINATION

Passing the qualifying examination is one of the steps required for advancement to candidacy. The other steps are satisfactory completion of all required courses (average GPA of at least 3.0) and certification by the supervising professor that the student has demonstrated in the laboratory the potential for productive and independent investigation. The examination includes both a written and an oral component.

Objective

The overall objective of the examination is to determine whether the student has a sufficient basis of knowledge, a command of the scientific method, and originality of thought necessary for advancement to the subsequent phase of mentored, thesis work as a Ph.D. candidate.

Specific objectives include assessment of the capacity of a student to: 1) assemble a database of knowledge on a particular topic; 2) use that database of knowledge to develop a focused and original research question and to propose specific testable hypotheses; 3) use the scientific method to design experiments to test the proposed hypotheses; 4) propose methods to evaluate the anticipated results of the experiments and consider alternative approaches; and 5) demonstrate mastery of fundamental concepts and principles of neuroscience, derived from the didactic coursework; and 6) to communicate both orally and in writing.

Responsibilities of the Faculty Advisor

A student is encouraged to request that a member of the Neuroscience Training Program graduate faculty serve as an advisor during the preparation for the examination. The faculty advisor will attend the oral examination as a non-participating, non-voting observer. The role of the faculty advisor will be to serve as a consultant to provide the student with general guidance in preparation of the proposal. The faculty advisor should advise the student whether the proposal is generally ready for distribution (i.e., thorough, well researched, generally accurate, etc.). The faculty advisor will not play an active role in the formulation of the research proposal and should not suggest specific goals, experiments, methods, or analyses. The

responsibility for the quality of the proposal in terms of originality, approach to solving the problem or testing the hypotheses, and significance rests completely with the student. The student may give an original interpretation or a re-interpretation of literature data, propose a series of experiments to test a hypothesis, or present a new theoretical approach to a problem.

The Examination Committee

The examination committee will comprise five credentialed mentoring faculty from the Neuroscience track. One member will be from the Neuroscience Student Oversight Committee (SOC) who will serve as chair of the committee. At least one member will be from a department other than that in which the student's faculty advisor has primary appointment. The committee will be chosen by the Neuroscience SOC.

Responsibilities of the Examination Committee

- Determine the initial feasibility of the proposal based on the student's outline
- Determine if the written proposal provides an adequate basis for an oral examination
- Provide the student with written comments/recommendations (in the event that the initial written proposal is not deemed suitable for defense)
- Sign the "Petition for Oral Examination" upon approval of the written proposal
- Conduct the oral examination
- Determine whether or not the student has satisfactorily defended his/her written proposal
- Sign the "Petition for Admission to Candidacy" or, in the event that the defense has been deemed unsatisfactory, provide the student with feedback that outlines specific aspects of the student's performance that need improvement in a second examination.

Responsibilities of the student

- Discuss ideas about a proposal with a faculty advisor
- Write and submit to the examination committee an outline of a proposal
- Write and submit to the examination committee an original proposal
- Present a copy of the proposal with a signed Petition for Oral Examination form to the Academic Programs Manager when the committee has approved the proposal
- Inform the SOC chair of the date of the oral examination
- Defend the proposal to the examination committee in an oral examination
- Consult with the faculty advisor regarding the commitment of time and insure that all other research and academic responsibilities are met

Scheduling

Except under special circumstance, approved by the SOC and Pharmacology COGS, the examination must be completed by **30 June** in the summer following the second academic year. The student is responsible for scheduling all activities related to the examination.

Suggested Timeline

- Choose a faculty advisor and discuss possible topics in **January (2nd year)**
- Submit outline by **1 February**
- Prepare written proposal during **February and March**
- Submit final proposal by **1 April**
- Complete oral examination by **1 June**
- Should a retest be necessary, both components of the examination (written and oral) must be completed by **30 June**. If a student fails to successfully complete the qualifying examination by this deadline, his/her progress will be reviewed by the SOC and COGS with the possibility of suspension of stipend or dismissal from the program.

General Guidelines for the Preparation of the Written Proposal to be used as the Basis of the Oral Examination

- a) The written component will comprise an NIH NRSA-style research proposal written on any acceptable topic in the field of neuroscience. It is permissible for the student to choose a topic in the area in which he/she plans to do his/her dissertation studies.
- b) The proposal must include hypothesis-guided experiments. The experiments should be designed to produce results, which clearly support or reject the associated hypotheses. It is not acceptable to propose experiments that are likely to yield equivocal results that will not discriminate between the truth or fallacy of the hypothesis. It is not acceptable to list a hypothesis that one cannot imagine to be false. It is not acceptable to propose purely descriptive experiments (i.e., I'll do this and see what happens.).
- c) The proposal should describe a project that one person could execute in about 2-3 years of work.
- d) The experiments proposed should be the logical next steps in some area, or should reinforce and extend recent advances in the area.

Format of the Written Proposal

- a) The text can not exceed 10 single-spaced typed pages, including figures and tables. Figures should have a title and a legend. Tables should have a title and an explanatory footnote. Figures and tables should be numbered as referenced in the text. Include attribution in the legend if a figure has been copied from elsewhere. Hand-drawn diagrams are acceptable so long as they reproduce legibly. Figures may be annotated to make your point more clear. Preliminary results are acceptable, but are not required or expected. The proposal should have a cover page with a title and names of the student, faculty advisor, and examination committee members. A suggested breakdown is as follows:

Abstract: ½ page

Specific Aims with Hypotheses: ≤ 1 page
Background & Significance: 2-4 pages
Experimental Design & Methods: 2-4 pages
Literature Cited: Not included in the 10-page limit

- b) Observe NRSA Guidelines:
- At least 0.5 inch margins on all sides
 - Number and place name on all pages
 - At least 10 point font (Helvetica or Arial 12 point is suggested)
 - Type density, including characters and spaces, can not exceed 15 characters per inch
 - References are unlimited and should be cited from the text by author and year
- c) The proposal must not contain text that is extensively quoted or paraphrased from any other work. Any quoted material must be given proper attribution.

Content of Specific Sections

- a) **Abstract** The abstract should provide an overview of the entire project including: 1) Background; 2) Hypotheses; 3) Aims; 4) Experimental Approaches and 5) Significance.
- b) **Specific Aims** Each (usually 2-4) should be summarized in a single numbered, explicit sentence associated with a short explanatory paragraph. At least one aim should be in the form: “Aim X is to test [hypothesis] by [experimental strategy].” Multiple aims could test the same hypothesis by different approaches, or test different hypotheses with the same collection of data. Some aims may be preparatory (i.e., to prepare a mutant protein, or to establish the power of a method on some test material, or to clone a gene); however, some of the aims must purpose studies that will test specific hypotheses.
- c) **Background and Significance** Briefly discuss the background to the proposal, critically evaluate current knowledge, and specifically identify voids in the literature that the project will address. State concisely the importance of the research to longer-term objectives. An exhaustive survey of the literature and a lengthy bibliography are not required as part of the written proposal, although the student will be expected to demonstrate a thorough understanding of the relevant literature during the oral defense. In the written document, include only information that defines the problem and that justifies the proposed work.
- d) **Experimental Design and Methods** Discuss the experimental design and the procedures to be used to accomplish the specific aims. Include the means by which the data will be analyzed and interpreted. Describe any new methodology and its advantage over existing methodologies. Discuss the potential difficulties and limitations of the proposed procedures and provide alternative approaches to achieve the aims.

The Experimental Design includes topics such as how many samples will be needed, what controls will be needed, and exactly what measurements will be the basis of determining whether or not the hypotheses are supported (accepted or rejected). Experimental Design often is best organized according to the aims. The Methods include precisely how an experiment is to be carried out. Methods may be included within the Experimental Design section; however, since the same methods are often used in several aims, it is sometimes more convenient to provide Methods in a separate section. Do not include an exhaustive list of details for Methods; rather give the name and purpose of the method, the reference you would follow and a brief discussion of how you will address any potential weaknesses in the methods. Do not invent new methods unless that is an explicit aim of the proposal. During the oral examination, the student will be expected to demonstrate a knowledge of the theory behind the methods.

This section often includes brief descriptions or discussions of the following: 1) future directions; 2) possible outcomes and potential problems and 3) expected timeline.

- e) **Literature Cited** For each citation, provide the names of all authors, the article title, the name of the book or journal, volume number, page numbers, and year of publication. Arrange in alphabetical order by first author. If you cite a reference, you are expected to have read and understood it. The committee may request inclusion of a recent Medline, or the equivalent, literature search in addition to the cited literature.

Oral Defense

During the oral component of the examination, the committee members examine the student on the proposal and related areas of neuroscience, which may include fundamental concepts and principles based on the student's completed course work. The oral component will consist of a brief (15-minute) formal presentation (e.g., PowerPoint) by the student that summarizes each of the elements of the proposal, followed by questions from and discussion with the examination committee.

Grading

Grading of the qualifying examination will be pass/fail and will be determined by the examination committee based on the student's performance on both the oral and written components of the examination. At least four of the five members of the examination committee must vote each component as pass for the student to successfully complete the examination.

Specific Issues to be Assessed During Grading

Does the student possess sufficient knowledge in the area of the examination? (Note: In the absence of remembering details, a solid perspective on what is known, where it

might be found and how it might be applied usefully to the problem should be considered favorably as a basis of knowledge.)

Has the student demonstrated an understanding of fundamental neuroscientific principles?

Has the student researched the specific background of the proposal well enough to understand the overall theory governing the work in this area? Can the student state how unexpected results would affect the current theory?

Does the student have an understanding of the theory underlying the specific methods proposed?

Can the student distinguish a hypothesis from a belief (a statement that the student cannot imagine being wrong)?

Can the student recognize when an experiment clearly rejects or supports a hypothesis? Does the student appreciate the implications of negative data?

Can the student identify and provide potential solutions for weaknesses in the proposal? Does the student provide appropriate controls to address possible weaknesses?

Can the student discuss what future direction should be taken given some specified outcome of the proposed experiments?

Specific Recommended Chronology of events

Except under special circumstance, approved by the SOC and Pharmacology COGS, the examination must be completed by 30 June in the summer term following the second year. The examination will be considered failed if not completed by the deadline. Since several revisions of the proposal may be required, students are strongly encouraged to begin several months before the deadline.

- 1) The student chooses a general topic for the proposal, requests a member of the Pharmacology graduate faculty to serve as an advisor, and discusses the proposal topic with the faculty advisor in terms of general feasibility.
- 2) The student writes an outline of the proposal (maximum of two pages) and submits it to the chair of the SOC who will convene a meeting of the SOC to choose members of an examination committee and a committee chairperson. Each of the members of the examination committee will be given the outline.
- 3) **Three days** after distribution of the outline, the chairperson of the examination committee will solicit opinions from the other committee members concerning the feasibility of the proposed qualifying examination subject. The chairperson then consults with the student about the committee's evaluation and either advises the student to write the full proposal (see below) or advises the student that the topic or specific aims do

not form an adequate basis for a proposal. In the latter case, the student may re-write or submit a different outline for consideration. The preparation of an acceptable proposal is the responsibility of the student.

- 4) Upon being advised to continue, the student writes the full proposal taking into consideration any initial concerns/suggestions of the committee.
- 5) The student distributes the full proposal to the committee. After **two weeks**, the committee members consult with the chairperson of the committee as to whether or not the proposal is approved for oral defense. If the proposal is not approved, the student will receive from the chairperson of the examination committee written comments from each of the examination committee members. The student then may re-write the proposal on a new topic or modify the original proposal based on the comments and recommendations of the committee. Upon resubmission of the written component, the student will be advised that they have either 1) passed the written component, at which point they will schedule the oral component of the examination or 2) failed the written component a second time, at which point they will be removed from consideration for advancement to candidacy. A proposal may be defensible (i.e. that it is based on testable hypotheses), but still be deficient (e.g. in experimental design or in scientific writing) such that a re-write is required. The student, not the committee, is responsible for generating an acceptable proposal. If serious flaws persist in the re-written proposal, the committee may approve the proposal for the oral exam and then question the student on the deficiencies of the proposal in the oral exam. Thus, "approval" of the written proposal does not guarantee that its content will be sufficient to pass the exam.

When the committee members approve the written proposal, they sign the "Petition for Oral Examination" form. The student forwards the signed form and a copy of the proposal to the Academic Programs Manager. At this time, the student schedules the oral exam, which should be completed by 1 June in the summer following the second year. The committee is entitled to a two-week period between approval of the written proposal and the oral examination. The student may consult with committee members about material to be covered in the examination.

- 6) During the oral component of the examination, the committee members examine the student on the proposal and related areas of neuroscience. The committee will question the student until a consensus is reached that ample information is available on which to evaluate the student's performance. A maximum of three hours will be allotted for the examination.
- 7) Approval of four of the five committee members is required for the student to pass the qualifying examination. Upon approval, examination committee members sign GSBS Form 32: Petition for Admission to Candidacy to substantiate that the student has passed the qualifying examination.

The student will be allowed to repeat the oral examination with the same committee one time if the student fails. The chairperson of the committee shall confer with the committee, the SOC chair, and faculty advisor to construct the requirements for the re-examination. They should agree on a format for a re-examination designed to allow the student to correct deficiencies revealed during the initial examination. The format may be a written follow-up with no oral examination, a repeat of the oral exam with no further writing, or both a re-write and a repeat oral examination. Within one week, the chairperson of the committee will give the student and the SOC chair a written explanation for the basis of the failure and provide guidelines to prepare for the re-examination. This information should also be provided to the COGS chair. The re-examination must be completed within three months of the first examination and by the 30 June deadline. If the student fails the re-examination, the student will be removed from consideration for advancement to candidacy.

- 8) Upon completion of the qualifying examination, satisfactory completion of all required courses, certification by the Supervising Professor that the student has clearly demonstrated the potential for productive and independent investigation, and receipt of GSBS Form 32, the SOC and COGS will decide whether to recommend to the Associate Dean of the Graduate School that the student be admitted to candidacy for the Ph.D. degree. The Associate Dean makes the final decision on admission to candidacy for the Ph.D. degree.

ADMISSION TO CANDIDACY

Requirements for Admission to Candidacy

1. Satisfactory completion of all required courses.
2. A cumulative GPA of at least 3.0 in all course work undertaken since matriculation in the program.
3. A report by the chair of the SOC, with approval by COGS, that the student has passed the qualifying examination.
4. A report by the student's chosen dissertation supervisor that the student has clearly demonstrated the potential for productive and independent investigation.
5. If the overall evaluation of the eligibility of the student for admission to candidacy for the Ph.D. degree is favorable, then SOC votes on approval of admission of the student to candidacy, with approval by COGS. The

chair of the COGS then submits a Petition for Admission to Candidacy for the degree of Doctor of Philosophy Form to the Dean for approval.

6. If approved, the student receives an official notification of admission to candidacy from the Dean of the Graduate School (GSBS Form 35).

DISSERTATION

Selection of the Temporary Supervising Committee

A Temporary Supervising Committee should be formed to assist the student in preparing the dissertation research proposal. This committee should be formed as soon as possible after the student has chosen a mentor, but no later than **three months** after the student's Admission to Candidacy. The members of this committee are selected according to the mutual agreement of the student, the supervising professor and the prospective committee members. The supervising professor must submit to the SOC the 'Training Program in Neuroscience Temporary Dissertation Supervising Committee Form' that lists the members of this committee. SOC will vote to approve the committee or make recommendations for changes in the committee to the supervising professor. In most instances, members of the Temporary Supervising Committee become members of the permanent supervising committee.

The temporary supervising committee must consist of at least four members:

1. the supervising professor, who serves as the chair of the supervising committee.
2. two additional members from the Graduate Faculty of the Neuroscience Training Program.
3. one member who must be a faculty member at UTHSCSA but not a member of the Neuroscience Training Program.

Preparation of the Dissertation Proposal

During the first year following admission to candidacy, the student should prepare his/her dissertation proposal in the format of a National Research Service Award (NRSA) grant proposal and submit the proposal to the Temporary Dissertation Supervising Committee for approval. The format for an NRSA is presented below. Additional information on NRSAs can be obtained from the NIH's website (www.nih.gov).

Students should include sufficient information in their proposal to permit an effective review without reviewers needing to refer to the literature. Brevity and clarity in the presentation are considered indicative of a student's approach and ability to conduct a

superior project. The entire proposal is **not to exceed 10 pages including all tables and figures**. The format for the proposal is as follows:

1. Specific Aims - State the specific purposes of the research proposal and the hypotheses to be tested.
2. Background and Significance - Sketch briefly the background to the proposal. State concisely the importance of the research described in this application by relating the specific aims to broad, long-term objectives.
3. Research Design and Methods - Provide an outline of:
 - o Research design and the procedures to be used to accomplish the specific aims;
 - o Tentative sequence for the investigation;
 - o Statistical procedures by which the data will be analyzed.
4. Potential experimental difficulties should be discussed along with alternative approaches that could achieve the desired aims.

Once the committee approves the proposal, the student will present the proposal to the Neuroscience Training Faculty in a formal seminar, and defend the proposal in a SOC meeting following the seminar presentation.

The SOC must approve each student's dissertation proposal and Permanent Supervising Committee.

Procedures - Temporary Supervising Committee

The Temporary Supervising Committee must first approve the dissertation research proposal and sign the 'Training Program in Neuroscience Approval of Research Proposal Form'. The student submits this form to the Academic Programs Manager. The student schedules a seminar at which he/she presents the dissertation research proposal to the Neuroscience Training Faculty. The student gives a copy of the approved written dissertation proposal to the Academic Programs Manager to distribute to each member of the SOC at least one week in advance of the presentation of the dissertation research proposal at a departmental seminar.

Procedures – SOC and COGS

The student defends his/her dissertation research proposal to the SOC at a meeting after his/her dissertation proposal seminar. During the defense, the supervising professor is present as a quiescent observer. Following the defense, the student is excused from the room and the supervising professor has the opportunity to share comments about the proposal made by the Temporary Supervising Committee. Following discussion and approval of the dissertation research proposal by the SOC, the Supervising Professor presents and describes the qualifications of the proposed membership of the permanent committee.

The Permanent Supervising Committee must consist of at least five members. The Supervising Professor serves as the chair of the supervising committee. Four of the members must be from UTHSCSA (the supervising professor, 2 members from the Neuroscience Training Program faculty and one other from UTHSCSA). One member must be from an outside institution not affiliated with UTHSCSA. It is the responsibility of the supervising professor to contact the proposed external committee member to determine if the individual is willing to serve on the student's dissertation supervising committee. The supervising professor should provide the individual with a copy of the dissertation research proposal to review and request that he/she provide comments about the strengths and weaknesses of the proposal. Additional members may be added as deemed appropriate.

SOC votes on whether or not to approve the proposed membership of the Permanent Supervising Committee. The Chair of the SOC will obtain approval of this decision from COGS, then prepare and send the 'Recommendation for Approval of Dissertation Research Proposal and Supervising Committee Form' to the Dean signifying that the SOC and COGS have reviewed and approved the dissertation research proposal and the Permanent Supervising Committee.

SUPERVISION OF THE DISSERTATION RESEARCH

Dissertation Supervisory Committee Meetings

The Dissertation Supervisory Committee (temporary or approved) is required by the SOC and COGS to meet by the end of the term each fall and spring. The student will provide a written progress report to her/his committee prior to the meeting. The report should include what the student's research aims were during the semester, the results of her/his research and how the student plans to proceed during the next reporting period. The report should not exceed six pages. The supervising professor is required to provide the Chair of the SOC with a brief written report of the student's research progress. If the Chair of the SOC does not receive a report of the student's progress by the end of the semester, the student will not be allowed to register for the subsequent semester. The scheduling of these meetings is the **student's responsibility**.

Major changes in the research status of the candidate, such as the selection of a new supervising professor, new supervising committee members or a substantive change in

research direction, must be submitted to the SOC for approval, followed by approval of COGS.

Registration for Dissertation

Students on the Ph.D. degree track may register for the Dissertation course (PHAR 7099) after the following actions have been taken:

- Approval of admission to candidacy for the Ph.D. degree by the Dean
- Approval of the dissertation research proposal by SOC, COGS, and the Dean
- Approval of the membership of the candidate's Supervising Committee by SOC, COGS, and the Dean

A candidate for the Ph.D. degree must register for at least two terms of Dissertation credits. Only one of the terms may be a summer session.

Final Credit Hours

A student must be registered for the semester or summer term in which he/she graduates. If a student is registering for only final credit hours in preparation of a dissertation and registers for no other courses, he/she is exempt from the minimum tuition requirement and pays only tuition based upon the number of credit hours for which he/she registers. Such registration shall be considered a full-time course load. The minimum number of final credit hours for the Ph.D. degree is three. A student may register for final credit hours only once.

International students must obtain approval from the Office of International Services (OIS) before registering for less than a full course load by completing and submitting a Request for Authorization to Reduce Course Load form (available in OIS).

PREPARATION OF THE DISSERTATION

When the data collection is completed or close to completion, the student will request permission from the Supervising Committee to stop doing experiments and to begin writing the dissertation.

Selection of Dissertation Format

There are two formats that may be used for the Ph.D. dissertation: Traditional Format & Chapter Format. The Chapter Format is the default format for all Ph.D. dissertations.

The **Chapter Format** consists of the following sections:

- a. Abstract
- b. Table of Contents
- c. General Introduction
- d. Literature Review

- e. Chapter I, II, III, etc.
- f. General Discussion
- g. Summary and Significance
- h. References

Each chapter should be organized in the format of an article that would be published in a scientific journal as follows:

- a. Title Page
- b. Abstract
- c. Introduction
- d. Materials and Methods
- e. Results
- f. Discussion

The **Traditional Format** consists of the following sections

- a. Abstract
- b. Table of Contents
- c. General Introduction
- d. Literature Review (This may be combined with the Introduction.)
- e. Materials and Methods
- f. Results
- g. Discussion
- h. Summary
- i. Appendix
- j. Literature Cited

A detailed description of the traditional format can be found in the booklet entitled *Instructions for Preparation & Submission of Theses, Dissertations and Dissertation Abstracts*. The booklet can be downloaded from the GSBS website.

FINAL ORAL EXAMINATION

When the supervising committee judges the dissertation to be suitable for defense, the supervising professor shall submit a Request for Final Defense & Oral Examination Form signed by all committee members to the Chair of SOC for her/his signature. The Chair of SOC will obtain COGS approval and signature of the COGS Chair. The signed request form, together with 3 copies of the abstract and the student's curriculum vita, must be submitted to the office of the GSBS at least two weeks prior to the scheduled date of the final oral examination. In addition, one copy of the entire dissertation should be electronically submitted to the GSBS for the formatting to be checked.

The GSBS makes the public announcement of the final oral examination. The Academic Programs Manager will inform the faculty and students of the Training Program in Neuroscience of the final oral examination.

All interested persons may attend the public defense and have the right to question the candidate. After the public defense, the final oral examination continues with an oral examination by the supervising committee. The supervising committee conducts the final oral examination with the supervising professor serving as the chair. This portion of the examination is restricted to the members of the student's supervising committee. The members of the supervising committee vote on the candidate's success or failure on the final oral examination. More than one vote for failure signifies failure of the examination.

The supervising professor submits the Report on Final Oral Examination Form to SOC for approval or disapproval of the recommendation by the supervising committee. In the event of a failing performance by the candidate, the supervising professor and supervising committee will submit a recommendation to SOC regarding remedial action. The SOC shall decide on the recommendation or other action to be taken, and convey their decision to COGS for approval.

GRANTING OF THE DEGREE

If SOC and COGS approve the recommendation of the supervising committee, then the Chairs of both SOC and COGS sign and submit the Report on Final Oral Examination and the Dissertation Approval Page signed by all of the supervising committee members, to the Dean. The student will then electronically submit the final version of the dissertation to the Dean's Office.

The Chair of SOC reviews the academic performance of the candidate as well as her/his performance on the final oral examination. The COGS Chair certifies that the candidate has satisfied all of the requirements for the degree of Doctor of Philosophy and recommends to the GFC that the candidate be granted the degree. If the GFC approves the recommendation, then the Dean will notify the President of the Health Science Center that the candidate has fulfilled all requirements of the GSBS for the Ph.D. Upon the candidate's certification by the President, the degree is conferred by the University of Texas System Board of Regents. If the GFC does not approve the recommendation, it will refer the matter to COGS with a recommendation for remedial action. COGS will then convey this recommendation to the SOC.

PROCEDURES FOR DISSERTATION AND THESIS BINDING

Typing and Binding of Dissertation

In the preparation of dissertations, students should follow the *Instructions for Preparation and Submission of Electronic Theses, Dissertations, and Dissertation Abstracts*, which can be downloaded from the GSBS website.

In addition to the electronic version of the dissertation required by the GSBS, the student should print two paper copies. The Program will cover the cost of having these bound. One copy will be retained by the Program and one copy will be given to the student. If the student desires additional bound copies, he/she will be responsible for the costs of copying and binding.

Please refer to the above-mentioned publication for more specifics on binding, microfilming, and optional copyrighting of the dissertation.

MASTER OF SCIENCE IN NEUROSCIENCE

The Training Program in Neuroscience does not offer a Master of Science degree. However, under special conditions, a student may petition to change academic tracks from Ph.D. to M.S. The student must submit to the Chair of the SOC a formal request explaining why it is necessary for him/her to change academic tracks. If the request is approved by SOC and COGS, the student's petition is then forwarded to the Graduate Dean's office for approval.

The MS degree is granted upon satisfactory completion of a minimum of 30 semester hours, additional requirements as determined by SOC and COGS, recommendation of the GFC and certification of the candidate by the Dean and President to the Board of Regents.

Master of Science Thesis Requirements

Thesis Supervising Professor

After the student's change of academic program is approved, the student must choose a supervising professor for his/her thesis research. The student should petition SOC in writing for approval of his/her thesis supervisor. The faculty member must be a member of the Graduate Faculty of the Training Program in Neuroscience, have an active research program, be willing to serve as the student's thesis supervisor and must have funds to support the student for the entire time required to complete the thesis research project. A student may not select a faculty member who does not have research funds to provide stipend support for the student.

Draft of the Thesis Research Proposal

The candidate shall submit a draft of a proposal for the thesis research to the supervising professor for review and modification. Subsequent drafts of the proposal may then be submitted for review and modification to other faculty members who have knowledge and expertise in the area of the research proposal. After approval of the final proposal draft by the supervising professor, the proposal is submitted to the SOC for consideration of approval.

Appointment of the Supervising Committee

Once the student's thesis proposal is approved by the SOC, the supervising professor and the candidate make recommendations to the SOC regarding the composition of the Supervising Committee for the thesis research. The Supervising Committee must consist of four people (the supervising professor, two members from the Neuroscience Training Program Graduate Faculty, and one member from UTHSCSA who is not a member of the Neuroscience Graduate Faculty). The supervising professor is

designated as Supervising Professor and Chair of the Supervising Committee. The Supervising Professor will convene the Supervising Committee as necessary to discuss the progress of the thesis research and the projected future work with the candidate. The Supervising Committee must be fully informed of the research progress and be able to provide continued supervision throughout. SOC should receive reports of the research progress from the Supervising Committee after each of its meetings with the candidate. It will be the Supervising Committee's responsibility to guide the candidate through the thesis research and certify to SOC that the candidate has carried out a research investigation of the caliber appropriate for a M.S. thesis and has defended it satisfactorily.

Upon selection of the Supervising Committee, the Chair of the SOC will submit a completed Form 42 Composition of Supervising Committee – The Master of Science Degree to COGS. After approval by COGS, the Chair of COGS will submit the completed form to the Graduate School Dean's Office. A copy of the proposed work must accompany the form. Each member of the Supervising Committee is required to sign the form to certify her/his approval to serve on the committee.

Registration for Thesis

Students on the M.S. degree track may register for the Thesis course (PHAR 6098) after the following actions have been taken:

- Approval of admission to candidacy for the M.S. degree by the Associate Dean
- Approval of the thesis research proposal by the SOC and COGS
- Appointment of a Supervising Committee for the thesis research by SOC and COGS

A candidate for the M.S. degree must register for one semester of thesis.

Final Credit Hours

A student must be registered for the semester or Summer session in which he/she graduates. If a student is registering only for final credit hours in preparation of a thesis and registers for no other courses, he/she is exempt from the minimum tuition requirement and pays tuition based upon the number of credit hours for which he/she is registered. The minimum number of final credit hours for the M.S. degree is one. International students must obtain permission from the Office of International Services (OIS) **before** registering for less than a full course load by submitting the Request for Authorization to Reduce Course Load form.

Submission of the Thesis

After members of the Supervising Committee agree that the research has progressed sufficiently for submission of the thesis, the draft of the thesis shall be submitted to the

Supervising Professor and the other members of the Supervising Committee as well as the Graduate School Dean's office for review and recommendation for modification.

The candidate should follow the guidelines outlined in the booklet entitled *Instructions for Preparation & Submission of Theses, Dissertations and Dissertation Abstracts*. The booklet can be downloaded from the GSBS website.

Final Oral Examination

The Graduate School requires that the thesis be defended by the candidate in a Final Oral Examination conducted by the Supervising Committee. The SOC may choose either of the options below as the format of the Final Oral Examination.

Option 1: SOC may require that the thesis be defended in a formal Final Oral Examination scheduled through the Graduate School Dean's Office and open to all interested persons. The procedure for arranging this Final Oral Examination is the same as that for the Ph.D.

Option 2: SOC may choose a less formal format that doesn't entail public notification from the Graduate School Dean's Office. In this case, the Supervising Committee submits a Request for Final Oral examination Form to the Chair of the SOC. If approved, the request then goes to COGS and the Graduate School Dean's Office.

Two copies of the abstract and the Vita should be submitted with the request for the candidate's files in the Registrar's Office and the Graduate School Dean's Office.

The Supervising Committee members vote on the candidate's success or failure on the Examination; more than one vote for failure signifies failure on the Final Oral Examination. In the event of a failing performance, the Supervising Committee submits the Report on Final Oral Examination to the SOC with recommendations regarding remedial action or further examinations. In this situation, The SOC shall decide on the recommendation or other action to be taken, and convey their decision to COGS for approval. If the student's performance in the Oral Examination is successful, the Supervising Committee submits the same report to the SOC, which then votes on whether to approve the recommendation of the Supervising Committee to grant the MS degree. The Chair of the SOC then conveys their decision to COGS for approval.

Recommendation for Granting of the Degree

Once the SOC and COGS approve the favorable recommendation by the Supervising Committee, the Chairs of both SOC and COGS sign and submit the Report on Final Oral Examination and the thesis Approval Page signed by the Supervising Committee members to the GFC for consideration. The candidate then electronically submits the final version of the thesis to the Graduate School Dean's Office. The GFC will consider

the recommendation for granting the degree when both the Report and the thesis file have been received.

If the recommendation for granting the degree is not approved, the Council will refer the matter to COGS with a recommendation for remedial action. COGS will then convey this recommendation to the SOC. If the recommendation is approved, the Dean of the Graduate School of Biomedical Sciences will notify the President of the University of Texas Health Science at San Antonio that the candidate has fulfilled the requirements for the degree of Master of Science. Upon the candidate's certification by the President, the degree is conferred by The University of Texas System Board of Regents.

MISCELLANEOUS INFORMATION

Graduate Teaching/Research Assistantship Stipends

Graduate students who are enrolled full-time and who remain in good academic standing may receive a yearly stipend in the form of a graduate teaching/research assistantship as recommended by COGS to the department Chair. Currently, this stipend is \$26,000 for all graduate students, and is the responsibility of the Principal Investigator of the laboratory in which the student is conducting his/her doctoral research. The Principal Investigator is responsible for the student's stipend beginning in the fall of the student's second year. Students who apply for and receive grant funding (e.g. a National Research Service Award {NRSA}) will be subsidized by the PI if the grant funding doesn't match that of the stipend.

Time to Degree

A minimum of 72 semester credit hours is required for a Ph.D. degree. It is expected that full-time Ph.D. candidates will complete the requirements for the Ph.D. degree within a maximum of six years or within 130 credit hours. If a student is unable to complete the requirements for the degree within this time period, the student and the supervising professor may petition the SOC for an extension. The SOC will then meet with COGS to make a determination based upon evidence of adequate progress that would justify an extension. The Neuroscience Training Program and/or the Principal Investigator has no obligation to financially support a graduate student for more than six years. In addition, students enrolled for more than 130 credit hours may be required to pay nonresident tuition for all subsequent semesters.

Distribution of the COGS Meeting Minutes

Distribution of the minutes of the meetings of the COGS is limited to the Graduate Faculty of the Pharmacology Graduate Program and the Graduate Student Representative.

Payment for Tutorial Services

A graduate student may not accept payment for tutorial services rendered to a student if the graduate tutor could potentially be involved in the student's evaluation through lecturing, grading of examinations, review of grades, etc.

If no such potential conflict of interest exists, then the graduate student may tutor students for remuneration provided the graduate student first informs the tutee of the fee to be charged for the service.

Proctoring of Examinations

As part of their teaching assistantship responsibilities, graduate students may be asked to help the faculty proctor examinations in various courses directed or taught by members of the Neuroscience Training Program faculty.

Tuition

All graduate students are classified as Teaching Assistants, and as such are eligible to be assessed the resident tuition rate throughout the academic program. However, in order to maintain resident status, out-of-state/country students must submit a Certificate of Employment prior to the census date of each term. This form can be obtained through the Academic Programs Manager.

Health Insurance

All UTHSCSA students are required to have major health insurance. A student health plan is available for purchase through United Health Care. Fees for this plan will be assessed on the student's tuition statement. If a student opts to subscribe to an alternative health insurance plan he/she must provide proof of the insurance coverage by submitting a UTHSCSA Health Insurance Coverage Information form and a copy of his/her insurance card prior to the tuition payment deadline each semester. Students with coverage through United Health Care are also required to submit this form each semester. The form can be obtained through the Academic Programs Manager.

COURSE DESCRIPTIONS

REQUIRED COURSES

CSBL 5095 - Experimental Design and Data Analysis (2 credits)

Course Director: Dr. William Morgan

Fall

The purpose of the course is to provide an introduction to experimental design and statistical analysis. The emphasis of the course will be on the selection and application of proper tests of statistical significance. Practical experience will be provided in the use of both parametric and nonparametric methods of statistical evaluation. Among the topics to be covered are: data reduction, types of distributions, hypothesis testing, scales of measurement, chi square analysis, the special case of the comparison of two groups, analysis of variance, a *posteriori* multiple range tests, tests of the assumptions of parametric analyses, advanced forms of the analysis of variance, linear regression and correlation analysis.

INTD 5000 - Fundamentals of Biomedical Sciences (8 credits)

Course Director: Dr. Ellen Kraig

Fall

This is a core course covering the fundamentals of biochemistry, molecular biology, cell biology, microbiology, immunology, and organismal & systems biology. The course is designed for first year graduate students matriculating into the integrated, multidisciplinary graduate program.

INTD 5008 - IMGP Laboratory Rotations

Fall/Spring

Course Director: Dr. Reto Asmis

This course provides an opportunity for students to participate in research activities in the laboratories of faculty members in different tracks to learn laboratory skills and to gain an introduction to the research fields of faculty members.

INTD 5040 - Fundamentals of Neuroscience I: Molecular, Cellular, & Developmental Neuroscience (3 credits)

Course Director: Dr. Eileen Lafer

Spring

This course is intended to introduce students to a broad survey of the basics of molecular, cellular, and developmental neuroscience. The course is organized into a

series of three modules: 1) Biochemical & Cellular Properties of Nervous System Cells; 2) Development of Neuronal Systems; and 3) Neurotransmission & Neuromodulation. Current topics and concepts are discussed in Discussion Sessions, which include student participation.

INTD 5043 - Fundamentals of Neuroscience II: Systems Neuroscience (3.5 credits)

Course Director: Dr. David Morilak

Fall

This course, the second component of our broad survey of the basics of neuroscience, begins at the level of the neural circuit, and guides the student through an understanding of increasingly complex levels of organization and function in the brain. Topics include neurotransmitter systems, sensory and motor function, motivated behavior, regulation and integration of autonomic, behavioral and emotional responses in the limbic system, higher order cognitive processes, and the neurobiological basis underlying some important psychiatric disorders and their treatment.

INTD 5047 - Neuroanatomy (2 credits)

Course Director: Dr. William Morgan

Fall

The purpose of this course is to provide students with a practical working knowledge of the structure of both the peripheral and central nervous system. The emphasis will be on the organization of the human brain, although the brains of other species may also be included if appropriate for a specific brain region. The course will look at each of the individual components of the central nervous system in some depth but will also emphasize the complex integration of these various components into a functional brain. The topics covered in the course are specifically designed to mesh in time with those covered in Fundamentals of Neuroscience II describing the function of these areas. For this reason, it would be best if these two courses were taken concomitantly. The course will be didactic with digital images, models, and wet specimens included in the course.

INTD 6090 NS - Neuroscience Seminar (1 credit)

Course Director: Dr. Tom Cunningham

Fall/Spring

Presentation and discussion of recent advances and research by staff, students, and outside scientists.

Each graduate student is expected to register for Seminar each fall or spring semester the student is enrolled in graduate school. If a student is registered for nine (9) or more credit hours, the student need not register for Seminar hours.

All students are required to attend each Neuroscience Program Seminar and Journal Club each semester he/she is enrolled in graduate school regardless of whether or not he/she is registered for Seminar. Students may be required to sign in at each seminar in order to record her/his attendance. Receiving two or more unexcused absences at Seminar or Journal Club will result in the loss of travel funds and/or the student receiving a grade of 'Unsatisfactory' for the course. Possible consequences of receiving a grade of 'Unsatisfactory' for Seminar include, but are not limited to the following: 1) the Program could terminate the student's funding; 2) student may be referred to the Director of the Neuroscience track for appropriate action; 3) student may be dismissed from the program. In addition, a student must petition the SOC in writing if he/she would like for an absence to be excused.

INTD 6002 - Ethics in Scientific Research (0.5 credits)

Course Director: Dr. Joel Baseman

Spring

All second-year graduate students are required by the Graduate School to take this course or its equivalent.

This course will deal with topics relevant to ethics in scientific research. The course will be taught on a 'case study' basis, dealing with real and hypothetical situations relevant to the conduct of scientific research. Topics discussed will include, but will not be limited to: data management, peer review, recognizing scientific misconduct, authorship and The University of Texas regulations relevant to human and animal research.

INTD 6071 NS - Supervised Teaching (1 credit)

Course Director: Dr. William Clarke

Fall/Spring/Summer

The Graduate School requires that all graduate students register for supervised teaching. A student should register for this course upon registering for his/her first lab rotation. The requirement will be fulfilled through presentations of lab rotation data, Journal Club presentations, the oral Qualifying Exam, and the Dissertation proposal and defense. If a student wishes to have a more formal Supervised Teaching experience, opportunities might be available to lecture in the Dental Hygiene Pharmacology course under the supervision of the Course Director.

INTD 6097 NS - Research (credit to be arranged)

Course Director: Dr. William Clarke

Fall/Spring/Summer

Independent, original research under the direction of a faculty advisor. Following admission to candidacy, students register for research hours to maintain full-time student status.

INTD 7099 NS - Dissertation: PhD Students (credit to be arranged)

Course Director: Dr. William Clarke

Fall/Spring/Summer

Prerequisite: Admission to candidacy for Doctor of Philosophy degree; approval of dissertation research proposal by the SOC, COGS, GFC and the Dean; and approval by GFC and the Dean of the Supervising Committee for the dissertation research recommended by the SOC and COGS.

A student must register for at least two semesters of Dissertation prior to the anticipated graduation date, but there is no required number of credit hours for Dissertation.

PHAR 5092 - Special Problems in Neuroscience: Research Practicum (1 credit)

Course Director: Dr. William Clarke

Summer

Students must complete one research practicum. This is a full-semester research experience during the summer following their first year. Successful completion of the research practicum is a requirement for admission into candidacy. A report by the principal investigator that the student has clearly demonstrated the potential for productive and independent investigation will be a requirement for admission into candidacy.

At the beginning of the research practicum, the principal investigator will discuss the criteria (below) that will be used to evaluate the performance of the student during the laboratory rotation. The Academic Programs Manager will provide a written copy to all students at the beginning of the practicum.

Students are required to write a report and to present a 15-minute talk following the completion of the research practicum. Students are encouraged to work with the principal investigator who will assist them in the preparation and organization of the oral presentation.

At the end of the research practicum, students write a short report (about 10 double-spaced, typewritten pages) in journal style (i.e. Introduction, Methods, Results and

Discussion). One copy of the report is given to the laboratory supervisor for evaluation and grading (see below), and a second copy is given to the Academic Programs Manager to serve as a file copy.

The principal investigator must be selected from the Graduate Faculty of the Neuroscience Training Program who have active research laboratories.

Students must complete one research practicum in the summer following their 1st year. This is a full-semester research experience, and mentors for the Research Practicum may be selected from the credentialed faculty of the Neuroscience Training Program who have active research laboratories. Students present a 15 minute talk following completion of the research experience.

ELECTIVE COURSES

BIOC 5091 - Special Topics in Biochemistry (2 credits)

Protein Stability, Dynamics, and NMR

This course covers the basic theory of NMR spectroscopy needed to understand and interpret NMR spectra of proteins. Methods are described for extracting structural and dynamic information. Equilibrium and pulse labeled hydrogen/deuterium exchange concepts and procedures will be introduced. Analyses of NMR spectra will be discussed as means of measuring the rates of conformational changes and segmental motions. NMR-based techniques will be augmented with complementary processes for measuring protein stability and dynamics such as scanning calorimetry, stopped flow and relaxation kinetics, and fluorescence spectrophotometry.

Protein Structure and Molecular Modeling

This course describes the rationale and procedures for accessing, manipulating, modifying, analyzing, modeling, comparing, and presenting macromolecular structures and sequences. Such concepts and analyses will provide students the opportunity to develop and test structure-based mechanistic and structure-function hypotheses. Hands-on methods and software to accomplish the analyses will be taught.

BIOC 6010 - Gene Expression (2 credits)

This is an advanced course designed to impart critical thinking and practical grant-writing skills while presenting the latest concepts about gene expression. We define gene expression as control at the levels of transcription, RNA processing and stability,

and translation and post-translational modifications. Our goal is not to catalog every transcription, splicing, processing or translation factor, but rather through judicious choice of examples and critical evaluation of the current literature, to teach students how to think about gene expression.

To these ends, our course will consist of didactic lectures, student presentations and discussion of papers from the current literature, and student preparation of a mock post-doctoral grant proposal

BIOC 6033 - Cell Signaling Mechanisms (2 credits)

This course covers the molecular mechanisms of action of various extracellular mediators including hormones, neurotransmitters, growth factors, cytokines, etc. and cell signaling events. Several areas will be discussed including (1) mechanisms of mediator synthesis, (2) interaction of mediators with specific receptors, (3) modulation by mediators of various second messenger systems including cyclic nucleotides, inositol phospholipids, calcium, protein phosphorylation, ion flux, etc. and (4) intra- and inter-cellular mechanism for regulating mediator action.

BIOC 6043 - Structure and Function of Membrane Proteins (2 credits)

This is an elective course targeted at students within any of the Graduate Tracks. It is required for the Membrane Proteins and Cell Signaling Track. It would be expected that it would be taken in the second or third year of graduate study, and would require completion of INTD 5000. The objective will be to provide a broad view, allowing for in depth consideration in selected areas, of the structure and diverse functions of proteins within a membrane environment. Specific topics covered will be:

- **Ion selective channels** (e.g. K^+ , Na^+ and Ca^{++} channels), and the basis of selectivity consistent with high flux rates, gating, and other forms of regulation (*Mark Shapiro - Physiology*)
- **Large membrane pores** (e.g. gap junctions, VDAC, P2Y, porins, translocons), their selectivity features, regulation, and physiological functions (*Bruce Nicholson - Biochemistry*)
- **Membrane transporters** (amino acid, neurotransmitter, glucose, aquaporins), their mode of function and regulation (*Jean Jiang - Biochemistry*)
- **Membrane pumps** (proton, ATPases, etc.) and the effects of lipids on membrane protein function (*Neal Robinson - Biochemistry*)
- **Membrane receptors** (GABA, Ach etc.) (*David Weiss - Physiology*)

The format of the course will be to have several didactic lectures within one or two areas, followed by student presentations of papers relevant to the topics presented.

CSBL 6020 - Concepts in Vertebrate Development (3 credits)

This course will employ classical experimental embryology background for presenting recent advances in molecular and cellular aspects of vertebrate development. Topics include: gametogenesis and fertilization, cleavage and midblastula transition, gastrulation, neural induction, neural crest migration, CNS patterning, limb development, and inductive events in endodermal differentiation. Emphasis will be placed on mechanisms of morphogenesis and differentiation at the molecular level.

CSBL 6021 - Animal Models (3 credits)

The relevant biology, applicability and practical use of a number of animal models to biomedical research is covered. Invertebrate (e.g., *C. elegans*) and vertebrate (e.g., fish and rodents) model systems are included in this course. Strengths and weaknesses of each organism that render them particularly valuable as animal models are emphasized. Experimental approaches and tools that are utilized in conjunction with each animal model are rigorously examined. The course is taught from primary scientific literature using classic historical publications and recent publications.

CSBL 6048 - Molecular Biology of Aging (3 credits)

The purpose of this course is to provide students with the most up-to-date information on the current understanding of the aging process. This advanced interdisciplinary graduate course will be offered to students who wish to either specialize in or have a strong background in the interrelated areas of aging and age-related diseases. Faculty from the Departments of Cellular & Structural Biology, Physiology, Pharmacology and Medicine will be involved in teaching this course, which will cover the molecular and cell biology of aging, model systems used for aging studies, age related changes in organs and tissues and age related diseases. This course is an elective for all Departments.

CSBL 6064 – Genetics (3 credits)

This course is designed to provide an overview of genetic research. Topics to be covered include: cytogenetics, somatic cell genetics, linkage analysis, genomics, evolutionary genetics, comparative genetics, and the use of animal models for studying human genetic diseases.

INTD 6041 - Basic Science Resident Lecture Series in Neurology (1.5 credits)

An interdisciplinary advanced elective in which students attend 20 lectures, selected from the full offering of daily one-hour lectures comprising the Neurology Residents' Basic Sciences lecture series. These lectures cover a range of topics, such as

Epilepsy, Movement Disorders, the Thalamus, Parkinson's Disease, Alzheimer's Disease, Stroke, Sleep, etc., all given from a clinical perspective. In addition, graduate students will have the opportunity to observe or participate in at least two enrichment activities related topically to the lectures they attend, which may include such settings as case presentations, diagnostic training sessions, or clinical observation sessions, again selected from the list of offerings in the Neurology Residents' series.

INTD 6045 - Clinical Practicum in Neuroscience (1 credit)

This course will provide students with a brief, but intense and very focused exposure to clinical practice in a relevant area of their choosing, designed and coordinated to best match their interests in close individual collaboration with a clinical mentor in one of the participating components – Neurosurgery, Neurology, Psychiatry or Endodontics. Representative activities could include participation in case presentation and treatment planning, attending rounds with physicians and residents, direct observation of clinical procedures, patient interviews, follow-up care and outcome review. Potential venues may include inpatient psychiatric ward, sleep clinic, epilepsy clinic, stroke clinic, neurosurgical theater and surgical ICU. In consultation with the course director, students will first select one of the following sub-sections, then design their individually tailored clinical practicum experience with the coordinator for that section.

PHAR 5013 - Principles of Pharmacology (3 credits)

Principles of drug action; receptor classification and quantitation; dose-response relationships; cellular mechanisms of drug action; fundamental concepts of drug-receptor interactions; voltage-gated and ligand-gated ion channels; drug actions mediated by transduction and non-transduction enzymes; time course of drug action; absorption, distribution, biotransformation and elimination of drugs; pharmacokinetics; experimental approaches to drug action.

PHAR 5020 - Basics of Research Design (1.5 credits)

Summer

Course Director: Dr. Andrea Giuffrida

The course aims at teaching first year graduate students fundamentals of research design and analysis of scientific literature to orient them with setting up scientific experiments and writing grant proposals. The course is divided in 3 sections:

- Research Design: students are thought how to choose testable hypotheses, design an experiment and control variables.
- Communicating scientific data: provides guidelines for communicating scientific data, writing a manuscript and reviewing scientific papers.

- Getting scientific ideas funded: provides guidelines for the preparation of grant proposals.

PHAR 5091 - Micro-electives (0.5 - 1 credit)

Micro-electives are courses, which can be of any type ("tutorial" or original literature review, short (2 week) didactic, technique, etc). Complete course descriptions can be found on the Department of Pharmacology's web site. The terms in which the courses are offered may vary. Check the online list of courses each term to determine the offerings. Sections .001-.011 are 1-credit courses. Sections .012-.017 are 0.5-credit courses.

5091.001	New Views on Monoaminergic Neurotransmission: Are Transporters Important? Course Director: Dr. Lynette Daws
5091.002	Drug Discovery: Nuts & Bolts Course Director: Dr. Wouter Koek
5091.003	Historical Perspectives of Receptor Theory Course Director: Dr. William Clarke
5091.004	Cell Membrane Microdomains and Signaling Course Director: Dr. William Clarke
5091.005	Neuropeptide Metabolism Course Director: Dr. James Roberts
5091.006	Serotonin: From Soup (Transmission) to Nuts (Behavior) Course Directors: Drs. Alan Frazer & Julie Hensler
5091.009	Current Issues in Basic Research on Mechanisms of Epilepsy Course Directors: Drs. José Cavazos and Robert Brenner
5091.010	Appetite Control: Adiposity Hormones and Neuropeptides Course Director: Dr. Xin-Yun Lu
5091.011	Fundamentals of Behavioral Pharmacology Course Director: Dr. Charles France
5091.014	Therapeutics: Central Nervous System Pharmacotherapeutics Course Directors: Drs. Lance McMahon & William Clarke
5091.015	Therapeutics: Chemotherapy Course Directors: Drs. Francis Lam & William Clarke
5091.016	Therapeutics: Endocrine Pharmacology Course Directors: Dr. William Clarke

PHAR 6025 - Molecular Pharmacology (2 Credits)

This course is presented in a journal club/paper discussion format and will focus on the molecular aspects of pharmacology, with emphasis on molecular biology, biochemistry, and cell biology of a variety of physiological systems subjected to pharmacological manipulation. The topics to be discussed will include molecular mechanisms of drug action, signal transduction and regulation, molecular approaches and recent advances in various areas of molecular pharmacology.

PHAR 6027 – Fundamentals of Neuroethics (1 Credit)

Course Directors: Dr. Andrea Giuffrida

Spring

Recent advances in neuroscience have considerably improved our understanding of brain function. However, the fascinating examination of brain's mysteries often intersects with the concerns of ethics and public policy. This course aims at presenting and discussing philosophical and scientific perspectives on major bioethical issues pertinent to neuroscience research. Several subjects will be covered in the course, including the effects of pharmacological and surgical interventions on the brain/min binomial, therapy versus enhancement, brain imaging and mental privacy, neurobiology of decision-making, consciousness, and unconsciousness and death.

PHYL 5045 – Mammalian Physiology (4 credits)

This course covers major organ system function, including cardiovascular, respiratory, renal, and endocrine/metabolic physiology. Lecture material is enhanced by supplemental discussion of research literature encompassing molecular biology, integrative function, and pathophysiological implications.

PHYL 6091 - Selected Topics in Physiology (2 credits)

6091-03 Cell Biology in Neural Science

This course, the second component of our broad survey of the basics of neuroscience, begins at the level of the neural circuit, and guides students through an understanding of increasingly complex levels of organization and function in the brain. Topics include neurotransmitter systems; sensory and motor function; motivated behavior; regulation and integration of autonomic, behavioral and emotional responses in the limbic system; higher order cognitive processes; and the neurobiological basis underlying some important psychiatric disorders and their treatment.

RADI 6024 – Radiological Anatomy & Physiology (3 credits)

This course will provide students with an opportunity to learn anatomy, physiology and commonly used medical terminology as it relates to radiologic imaging. Anatomic and physiologic features will be illustrated with radiologic images in formats commonly encountered in clinical radiology. By the end of the course, students are expected to be familiar with basic medical anatomy, physiology, and some basic pathology as related to specific organs for which radiologic images are commonly applied.