GUIDELINES FOR GRADUATE STUDY

MS & PhD Programs in ANATOMY

Department of Anatomy and Neurobiology
School of Medicine
University of Puerto Rico
Medical Sciences Campus

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Department of Anatomy
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for the Master of Science and Doctor of Philosophy degrees
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1) Definition of Guidelines

The following guidelines for the graduate program of the Department of Anatomy and Neurobiology describe in detail various aspects of the Graduate Program of the Department of Anatomy and Neurobiology and are meant to serve as a working guide for students, faculty and staff. These guidelines do not describe all regulations for the graduate programs and are subordinate and supplement the *Manual of Requirements and Regulations of the Division of Biomedical Sciences & Graduate Studies toward the Master of Science and Doctor of Philosophy Degrees* (October 2013) of the University of Puerto Rico School of Medicine [from here on, the *Manual of the Biomedical Sciences Graduate Program*].

2) Purpose of the Graduate Program

The graduate program of the Department of Anatomy and Neurobiology exists to train students for research and teaching careers in anatomical and/or neurobiological disciplines. It comprises Master of Science and Doctor of Philosophy Degree programs as well as a Concurrent MD/PhD program. The purpose of the **Master of Science program** is to prepare students to teach courses in the fields of Anatomy and/or Neurobiology at the college level and to train them in research methods in these areas. The purpose of the **Doctoral program** is to train students for research careers in Anatomy and/or Neurobiology, as well as prepare them to teach courses in these fields at the college level. The goal of the **Concurrent MD/PhD program** is the same as the Doctoral program but with an emphasis on developing researchers who use anatomical and neurobiological methodologies to approach problems of clinical relevance.

3) Director, Graduate Coordinator & Committee

The Chair of the Department of Anatomy & Neurobiology serves as Director of the department´s Graduate Programs. One faculty member will be appointed by the Chair as Graduate Coordinator and will be responsible, along with the Director, for the administration of the graduate program and will become a member of the School of Medicine´s Committee for Graduate Studies. Another faculty member will be appointed by the Chair as Associate Graduate Coordinator, to assist and/or substitute for the Graduate Coordinator whenever he or she needs due to official duties, travel, vacation or other justified reasons. All regular full-time faculty members of the Department are part of the department´s Graduate Committee, which will be chaired by the Graduate Coordinator. The Graduate Committee, the Graduate Coordinator, and the Program´s Director are all responsible for the evaluation of candidates for admission to the program, as well as for the evaluation and implementation of changes in the program. Other duties of the Anatomy and Neurobiology Graduate Coordinator include:

- serving as advisor to those students who do not yet have a thesis or dissertation advisor;
- implementing departmental graduate program regulations on a day-to-day basis;
- guiding and assisting students in fulfilling the requirements of the graduate programs;
- compiling the lists of graduate courses to be offered by the department´s faculty each academic session and submitting it, through the Program Director, to the Graduate Program Office at the Associate Deanship for Biomedical Sciences;
- advising students on preparing each academic session´s program of study and ultimately approving the final programs;

- advising and following up with the department faculty on all issues related with the graduate program (e.g., creation of courses or course sections, tracking and reporting of student attendance and grades, establishment of thesis committees, etc.);
- coordinating the department's efforts to promote its graduate programs by organizing and/or participating in outreach activities, open houses, academic program fairs, preparation and distribution of printed and online advertising, etc.;
- provide orientation to students interested in applying to the department´s graduate programs; and
- carrying out administrative procedures requested by the Associate Deanship for Biomedical Sciences and/or the Office of the Registrar (e.g. submission for approval of student´s thesis committees, certifications of completion of requirements for graduation; among other duties).

These and any additional responsibilities of the Graduate Coordinator will be informed to the appointed person by the Director of the department´s Graduate Programs at the time of appointment, who will provide the needed training and orientation regarding the department´s graduate programs and procedures that need to be carried out.

4) Selection and Admission of Graduate Students

Prospective graduate students can obtain an application for admission from the Division of Graduate Studies of the Associate Deanship for Biomedical Sciences of the School of Medicine *(http://www.md.rcm.upr.edu/biomed/admission.php)*. The admission requirements for the Graduate Program are:

a. A Bachelor's degree or its equivalent (as determined by the Registrar's Office) with a grade point average (GPA) of at least 3.0 overall and 3.0 in the basic science + math courses.

b. Full working knowledge of English and Spanish.

c. Submission of the general Graduate Record Examination (GRE) scores.

d. A statement, written in English, of no more than 250 words setting forth the applicant's reasons for applying for graduate work in the chosen department's Graduate Program, including any relevant previous research experience and his or her future professional goals.

A completed application includes official transcripts of grades and three letters of recommendation; two letters shall be from professors in the student's major area and the third shall be from a professor outside the student's major. The completed application must be submitted no later than December 1st of the academic year, or the date determined by the Biomedical Sciences Graduate Division. The manner in which this information will be evaluated will adhere to the prevailing guidelines set forth in the *Manual of the Biomedical Sciences Graduate Program.*

Candidates for graduate work in the Department of Anatomy and Neurobiology are required to have certain minimal course prerequisites. These are: 2 semesters of general chemistry, 2 semesters of organic chemistry, 2 semesters of general physics, mathematics through at least pre-calculus, and at least 12 credits of biology or the equivalent. (It is desirable, although not

required, that students take courses in biochemistry, cellular/molecular biology, anatomy, embryology, histology, neuroscience, physiology, and/or genetics). It should be understood, however, that compliance with course requirements alone does not guarantee acceptance. On the other hand, should an otherwise qualified candidate lack one or more of the prerequisites, the applicant could be accepted, as determined by the Department´s Graduate Committee and Chair, with the requirement that the deficiencies in prerequisites be made up within one calendar year of the date of initial registration (or before the beginning of the student's second academic year).

Each candidate, upon initial registration in the Graduate Program of the Department of Anatomy and Neurobiology, will become an advisee of the Anatomy and Neurobiology Graduate Coordinator.

5) Master of Science (M.S.) Program

The purpose of the Master of Science program is to train students to teach anatomical and/or neurobiological disciplines at the college level and to understand and be able to apply concepts, techniques and procedures used in the design and conduction of experimental anatomical and/or neurobiological research.

Program of Study

1) Residency Requirement: The Master of Science Degree program of the Department of Anatomy and Neurobiology shall require a minimum of one (1) calendar year (12 months) in residence at the University of Puerto Rico.

2) Language Requirement: The graduate student needs a full working knowledge (i.e. reading, writing and speaking) of English and Spanish. Knowledge of other languages is desirable, but there is no additional language requirement set by the Department.

3) Course Requirements: As a minimum, thirty-three (33) credit hours of the graduate level courses indicated in the table below must be completed, with an overall grade point average (GPA) of B (3.0) or better, and grades of B (80%) or better in departmental (ANAT) required courses. Students whose overall GPA drops below 3.0 will be placed on probation and will have a maximum of one semester to bring their grades up to fulfill the 3.0 requirement (see the *Manual of the Biomedical Sciences Graduate Program* for further details). If the GPA remains below 3.0 after this probation period, the student will be automatically dismissed from the program.

Required Courses for the Master of Science in Anatomy

Course No.	Title	Credits
ANAT 8411	Human Gross Anatomy I	4
ANAT 8412	Human Gross Anatomy II	4
ANAT 8513	Human Embryology I	1
ANAT 8514	Human Embryology II	1
ANAT 8611	Human Neuroanatomy and Neuroscience I	2
ANAT 8612	Human Neuroanatomy and Neuroscience II	3

ANAT 8613	Human Cell Biology and Histology I	2
ANAT 8614	Human Cell Biology and Histology II	2
ANAT 8526	Practice in Teaching	3
ANAT 8532	Seminar & Journal Club I	1
ANAT 8532	Seminar & Journal Club II	1
CBIO 8500	Statistics for the Biomedical Sciences	3
ANAT 8595	Master's Thesis Research	6
	Total	33

4) Practice in Teaching: All graduate students in the Department of Anatomy and Neurobiology are expected to assist in the teaching program of the Department. The responsibilities of the graduate student as a teaching assistant for department courses may include the following:
   a) Attending staff and organizational meetings of the course;
   b) Attendance at scheduled lectures and dissection laboratories;
   c) Aiding faculty and students during dissection laboratory sessions;
   d) Performing preparatory cuts and setup for dissection laboratory sessions;
   e) Providing student tutoring and/or review sessions;
   f) Participation in moderating student active learning sessions;
   g) Participation in setting up, supervising, and dismantling of dissection laboratory practical examinations;
   h) Participation in the preparation, administration, and/or grading of examinations and assessments given in the course;
   i) Participation in the preparation and delivery of at least one lecture and/or review session in a formal course.

   The specific responsibilities for each graduate student will be determined by the Practice in Teaching course coordinator, the Graduate Program Coordinator, and/or the Department Chair.

5) Selection of Thesis Advisor and Committee: The student must identify a thesis research advisor and committee no later than the end of the 1st semester of the second academic year (see the *Manual of the Biomedical Sciences Graduate Program* for details on requirements and procedures to be followed). To be able to do this, the students may rotate through different laboratories in the department (with or without course credits) for at least one academic session (semesters and/or summer). Once the student selects a Thesis Advisor within the department, together they´ll select members of the Thesis Committee, which will consist of the Thesis Advisor, one faculty from the Department of Anatomy & Neurobiology, and one faculty from outside the department. The student and the Thesis Advisor must ***both*** agree on who will be invited to become members of the Thesis Committee. Once the selection is made, the student will invite each potential member in writing (via e-mail or letter), asking the faculty member to also respond in writing to the invitation. These invitations and responses should then be forwarded to the Coordinator of the Graduate Program in Anatomy and to the Department Chair so they can refer the proposed Thesis Committee via letter to the Committee on Graduate Studies for their consideration and final approval.

6) Developing Specific Aims of Thesis Project: During the 6 months immediately following the selection of the Advisor, the student is expected to establish the focus of the Thesis

Research and develop the specific aims and general background, significance, and outline of the project, in consultation and with the assistance of the Advisor. During these 6 months, and no later than the end of the 1st semester of the 2nd academic year, the student will convene a Thesis Committee Meeting to present its members these aims and basic elements of the project with the intention of receiving input and suggestions and obtaining their approval to initiate preliminary work on the Thesis Proposal. On these first and subsequent meetings with the Thesis Committee, a form known as Appendix E (see the Manual of the Biomedical Sciences Graduate Program for details) must be filled out summarizing the issues presented and discussed and the agreements reached during the meeting, and including the signatures of the student, Thesis Advisor and the members of the Thesis Committee. The Thesis Committee must meet at least once each year, and the original and signed Appendix E form for each meeting must be turned in to the Associate Deanship for Biomedical Sciences, also sending a copy to the Coordinator of the Graduate Program in Anatomy and the Department Chair.

7) Thesis Proposal: A thesis is required for the Master of Science Degree. While the subject of the Master's Thesis may be suggested by the Thesis Advisor, it is expected that the student will carry out the research project independently, with the mentorship and aid of his/her thesis advisor and members of the thesis committee. The student will write a thesis research proposal and will present and defend it orally, no later than 6 months after establishment of the thesis committee. The proposal should be developed with the Advisor, in consultation with committee members. A Master´s Degree research project should be one that can be completed in approximately one year, with the expectation of publishing its results as at least one original research article in a peer-reviewed scientific journal. After obtaining the approval of the Advisor, the student will provide the written proposal to the members of the thesis committee with sufficient time prior to its oral presentation (~3-4 weeks in advance). On the date of the proposal´s oral presentation and defense, the student will be expected to answer questions from the members of the committee, including the advisor. He/she will then be asked to step outside of the room and the committee will discuss and evaluate as a group the quality of the student´s performance during the oral defense, as well as on the written document. Following this process, the student will be asked to return to the room and the advisor will inform him/her of the committee´s determination. If the student´s proposal and its oral presentation and defense are deemed satisfactory, the committee members will sign an approval sheet (see the *Manual of the Biomedical Sciences Graduate Program* for details on the contents and format for this sheet), which will then need to be turned in along with a printed copy of the proposal at the Division of Graduate Studies. The committee may postpone the signing of the approval sheet if they deem necessary that the student makes changes and corrections to the written proposal, and/or if they think the student´s oral presentation and defense were not satisfactory. In the former case, the approval sheet is to be signed upon providing evidence of completion of the requested changes to the written proposal. In the latter case, the student would have one more opportunity, in no more than 60 calendar days, to repeat the oral presentation and defense and obtain the final approval of the proposal from the committee members. Failure to achieve this approval after a second oral presentation and defense of the proposal will automatically result in dismissal from the graduate program.

8) Thesis Writing and Defense: Upon completion of the research project and writing of the Master´s Thesis, the student and advisor will establish a date for the Thesis Defense which should be held no later than four (4) calendar years, of the date of initial registration in the Graduate Program of the Department of Anatomy and Neurobiology, no less than two (2) months prior to the intended date of graduation. Written communication of this date will be sent by the student to the Department Chair, to the Division of Graduate Studies, and to the members of the student's Thesis Committee who are responsible for evaluating the Thesis and its oral presentation and defense (see below, "Procedure for the completion of a Thesis or Dissertation"). It is expected that the student, with the aid of the advisor, submits at least one manuscript for publication in a peer-reviewed journal before graduating from the MS program.

9) Expected Time-line: The MS program is designed for completion in 3 years. Required coursework (other than the Master´s Thesis Research credits) is to be completed no later than the end of the 2nd academic year. A thesis research advisor is to be selected and a thesis committee* appointed and then approved by the school´s Graduate Studies Committee no later than the end of the first semester (December) of the 2nd academic year. The proposal for the thesis research project is to be presented to and approved by the thesis committee no later than the end of the 2nd academic year (July 31st). The thesis defense is to be held no later than the 2nd semester of the 3rd academic year, and the approved final version of the thesis must be turned in at the office of the school´s Graduate Program no later than May of the 3rd academic year. The recommended curricular sequence for the Master`s Degree Program is as follows *(assuming all courses are available each year; marked in red are required activities not linked to course credits)*:

First Year: 12 Credits

ANAT 8532	Seminar and Journal Club I	1
ANAT 8411	Human Gross Anatomy I	4
ANAT 8513	Human Embryology I	1
ANAT 8412	Human Gross Anatomy II	4
ANAT 8514	Human Embryology II	1
ANAT 8532	Seminar and Journal Club II	1
	Research Laboratory Rotation *(ANAT 8996*)*	

**although not required, the student may register in this elective course to receive credit and/or maintain active student status*

Second Year: 15 Credits

ANAT 8613	Human Cell Biology and Histology I	2
ANAT 8611	Human Neuroanatomy and Neuroscience I	2
ANAT 8526	Practice in Teaching	3
CBIO 8500	Statistics for the Biomedical Sciences	3
	Research Laboratory Rotation *(ANAT 8996*)*	
	Selection of Thesis Research Advisor	

Appointment and Approval of Thesis Committee

ANAT 8614	Human Cell Biology and Histology II	2
ANAT 8612	Human Neuroanatomy and Neuroscience I	3
	Research in Advisor`s Laboratory *(ANAT 8593*)*	
	Thesis Proposal Preparation *(ANAT 8596*)*	

Presentation and Approval of Thesis Proposal

**although not required, the student may register in this elective course to receive credit and/or maintain active student status*

Third Year: 6 Credits

ANAT 8595	Master's Thesis Research	6
	Presentation and Defense of Thesis	

Failure to fulfill the expected time limits will be grounds for placing the student on probation, with a maximum of one subsequent academic session (semester or summer) to comply with the missed deadline. If after the probationary period the student has still not complied with the program`s time limit requirements, this will be grounds to be automatically dismissed. Failure to fulfill more than one expected time limit will be grounds for automatic dismissal from the program.

Any changes or extensions to these time limits, due to special and justified circumstances, would need to be discussed in advance with the thesis advisor and committee, and with the Director and Coordinator of the Anatomy Graduate Program. In the event the requested changes were deemed to be justified and workable within the parameters of the Manual of the Biomedical Sciences Graduate Program and the campus Manual of the Registrar, they would ultimately need to be presented to the faculty of the department for their approval and subsequent ratification by the Division of Graduate Studies of the Associate Deanship for Biomedical Sciences of the School of Medicine.

6) Doctor of Philosophy (Ph.D.) Program

The purpose of the Doctoral Program of the Department of Anatomy and Neurobiology is to train students to perform scholarly research in anatomical and or neurobiological disciplines, and also be able to teach these disciplines at the college level.

Program of Study

1) Residency Requirement: The Doctorate in Philosophy Degree program of the Department of Anatomy and Neurobiology shall require a minimum of two (2) calendar years (24 months) in residence at the University of Puerto Rico.

2) Language Requirement: The graduate student needs a full working knowledge (i.e. reading, writing and speaking) of English and Spanish. Knowledge of other languages is desirable, but there is no additional language requirement set by the Department.

3) Course Requirements: As a minimum, sixty-four (64) credit hours of the graduate level courses indicated in the table below must be completed, with an overall grade point average (GPA) of B (3.0) or better, and grades of B (80%) or better in departmental (ANAT) required courses. Students whose overall GPA drops below 3.0 will be placed on probation and will have a maximum of one year (two semesters + one summer session) to bring their grades up to fulfill the 3.0 requirement. If the GPA remains below 3.0 after this probation period, the student may be automatically dismissed from the program.

Required Courses for the Doctor of Philosophy in Anatomy

Course No.	Title	Credits
ANAT 8411	Human Gross Anatomy I	4
ANAT 8412	Human Gross Anatomy II	4
ANAT 8513	Human Embryology I	1
ANAT 8514	Human Embryology II	1
ANAT 8611	Human Neuroanatomy & Neuroscience I	2
ANAT 8612	Human Neuroanatomy & Neuroscience II	3
ANAT 8613	Human Cell Biology and Histology I	2
ANAT 8614	Human Cell Biology and Histology II	2
FISA 8105*	Basic Concepts on Human Physiology	3
BCHM 8511*	Biochemistry I	3
ANAT 8526	Practice in Teaching	3
ANAT 8525 or 8526	Practice in Teaching	2 or 3
ANAT 8528, 8591, 8593, 8596, 8996 CBIO 8991, 8992, 8506	Electives*	12
ANAT 8532	Seminar & Journal Club (4 semesters)	4 (1 per session)
CBIO 8500	Statistics for the Biomedical Sciences	3
ANAT 8599	Dissertation Thesis Research	15
	Total	64-65

**or equivalent course recommended and authorized by the Department*

Credit towards the Ph.D. degree may be received for courses taken for the Master's degree, through course convalidation as specified in the campus´ *Manual of the Registrar*.

4) Practice in Teaching: All graduate students in the Department of Anatomy and Neurobiology are expected to assist in the teaching program of the Department. The responsibilities of the graduate student as a teaching assistant for department courses may include the following:
   a) Attending staff and organizational meetings of the course;
   b) Attendance at scheduled lectures and dissection laboratories;
   c) Aiding faculty and students during dissection laboratory sessions;
   d) Performing preparatory cuts and setup for dissection laboratory sessions;
   e) Providing student tutoring and/or review sessions;

f) Participation in moderating student active learning sessions;
g) Participation in setting up, supervising, and dismantling of dissection laboratory practical examinations;
h) Participation in the preparation, administration, and//or grading of examinations and assessments given in the course;
i) Participation in the preparation and delivery of at least one lecture and/or review session in a formal course.

The specific responsibilities for each graduate student will be determined by the Practice in Teaching course coordinator, the Graduate Program Coordinator, and/or the Department Chair.

5) Selection of Dissertation Research Advisor and Committee: The student must identify a dissertation research advisor and committee no later than the end of the second academic year (July 31st; see the *Manual of the Biomedical Sciences Graduate Program* for details on requirements and procedures to be followed). To be able to do this the students may rotate through different laboratories at the department (with or without course credits) for at least one academic session (semesters and/or summer). Once the student selects a Dissertation Advisor within the department, together they´ll select members of the Dissertation Committee, which will consist of the Dissertation Advisor, two other faculty from the Department of Anatomy & Neurobiology, one faculty from outside the department, and a fifth member that may be from or outside the department. The student and the Dissertation Advisor must ***both*** agree on who will be invited to become members of the Dissertation Committee. Once the selection is made, the student will invite each potential member in writing (via e-mail or letter), asking the faculty member to also respond in writing to the invitation. These invitations and responses should then be forwarded to the Coordinator of the Graduate Program in Anatomy and to the Department Chair so they can refer the proposed Dissertation Committee via letter to the Committee on Graduate Studies for their consideration and final approval.

6) Dissertation Requirement: The purpose of obtaining a PhD degree from the Department of Anatomy and Neurobiology is to become proficient in various aspects of experimental scientific research. Thus, the dissertation forms an integral part of the Doctoral program. Research for the dissertation will be done under the supervision of a qualified advisor, as established in the *Manual of the Biomedical Sciences Graduate Program*. It is expected that the creative and technical work involved, as well as the analysis and interpretation of the data collected will be the work of the student. The dissertation is expected to report the results of original research in Anatomy and/or Neurobiology, and be of a quality that makes it suitable for publication in peer-reviewed journals within the field of interest. A PhD degree research project should be one that can be completed in approximately three years, with the expectation of publishing its results in at least 2-3 original research articles in peer-reviewed scientific journals. It is expected that the student, with the aid of the advisor, submits at least one (preferably 2-3) manuscript(s) for publication in such journals before graduating from the PhD program.

7) Developing Specific Aims of Dissertation Project: During the 6 months immediately following the selection of the Advisor, the student is expected to establish the focus of the Dissertation Research and develop the specific aims and general background,

significance, and outline of the project, in consultation and with the assistance of the Advisor. During these 6 months, and no later than the end of the 1st semester of the 3rd academic year, the student will convene a Dissertation Committee Meeting to present its members these aims and basic elements of the project with the intention of receiving input and suggestions and obtaining their approval to initiate preliminary work on the Dissertation Proposal. The establishment of these aims and core structure of the project will also serve as the basis for designing the Qualifying Examination. On these first and subsequent meetings with the Dissertation Committee, a form known as Appendix E (see the *Manual of the Biomedical Sciences Graduate Program* for details) must be filled out summarizing the issues presented and discussed and the agreements reached during the meeting, and including the signatures of the student, Dissertation Advisor and the members of the Dissertation Committee. The Dissertation Committee must meet at least once each year, and the original and signed Appendix E form for each meeting must be turned in to the Associate Deanship for Biomedical Sciences, also sending a copy to the Coordinator of the Graduate Program in Anatomy and the Department Chair.

8) Doctoral Written Qualifying Examination: The main purpose of the qualifying examination is to assess the extent to which each student has mastery and the ability to synthesize, integrate, and apply core knowledge in the chosen field of specialization, and to gauge the students' readiness for developing, conducting, and completing an independent experimental research project that will produce significant new knowledge with high probability of publication in relevant bona fide peer-reviewed scientific journals. The examination uses a take-home format, and is designed to assess the student´s ability to:
   - identify, understand, recall, and draw appropriate conclusions from the relevant scientific literature;
   - identify significant questions and gaps in knowledge in a specific field;
   - design suitable and original research strategies and experimental plans to test specific hypotheses;
   - know and understand the principles and guidelines underlying good research practices necessary to secure solid scientific rigor;
   - communicate clearly and effectively in writing; amongst other research skills.

   The Written Qualifying Examination shall be given after the student has completed all course requirements (with the exception of ANAT 8599) and after the Dissertation research project´s specific aims and core structure have been established and approved by the Dissertation Committee. The examination must be taken and passed no later than the end of the 3rd academic year (July 31st).

   The Dissertation Committee will prepare and administer the written Qualifying Examination, which shall focus on those areas of study relevant to the proposed field of research. Each committee member, including the advisor, will prepare 2 questions, and of the total 10 questions (or 12 in the case of Dissertation Committees with 6 members), the student must answer a minimum of 6 questions, selecting at least one question from each committee member. The committee members may leave it up to the student to decide which of their two questions they will answer, or they may identify one of the questions as mandatory and the other one as optional. It will be the responsibility of the Dissertation Research Advisor to provide the members of the committee with specific guidelines on

how to prepare their questions, and to provide the student with specific guidelines to complete the examination.

The student will have 10 calendar days to complete the examination, with the understanding that during that period of time he/she may not talk or consult with anyone other than the members of the committee regarding any aspect or content of the exam. A minimum grade of 80% in the overall exam (average of the grades of the 6 questions the student answers) must be obtained, also having a minimum grade of 80% in at least 4 of the 6 questions that are answered to pass the exam. The student's advisor will have up to 5 calendar days to send each committee member the student´s response(s), and each committee member will have up to 14 calendar days to read, evaluate, and grade the student´s answer(s), and will inform the advisor in writing of these results within that same time period. A formal letter informing of the results obtained in the Written Qualifying Examination must be prepared and sent via e-mail to the student by the advisor, with copies to the Chair of the Department of Anatomy and Neurobiology and the Coordinator of the Graduate Program in Anatomy, no later than 21 calendar days upon the student´s completion of the exam. The Chair of the Department of Anatomy and Neurobiology and the Coordinator of the Graduate Program in Anatomy will in turn notify the Coordinator of the School of Medicine´s Graduate Program, and the Associate Dean for Biomedical Sciences of the student´s performance in the exam.

If the student fails the Qualifying Examination, he/she will be required to take a second examination with new questions within the next 60 calendar days. The Qualifying Examination may be repeated only once following a first unsuccessful attempt. Failure to pass a second examination will automatically result in dismissal from the Doctoral graduate program. At the discretion of the Dissertation Research Advisor, and with the approval of the Chair and Faculty of the Department, the student may be given the opportunity to transfer to the Master´s Degree program, only if he/she is capable of fulfilling the requirements to complete the MS degree in Anatomy no later than December 31 of the student´s 4th academic year.

9) Dissertation Proposal: After passing the Written Qualifying Examination, the student will write a dissertation research proposal and will present and defend it orally, no later than the end of the 4th academic year (July 31st). The proposal should be developed with the Advisor, in consultation with committee members, using the specific aims, general background and significance, and outline of the project that were approved earlier (see #7 above). After obtaining the approval of the Advisor, the student will provide the written proposal to the members of the Dissertation Committee with sufficient time prior to its oral presentation (~3-4 weeks in advance). On the date of the proposal´s oral presentation and defense, the student will be expected to answer questions from the members of the committee, including the advisor. He/she will then be asked to step outside of the room and the committee will discuss and evaluate as a group the quality of the student´s performance during the oral defense as well as on the written document. Following this process, the student will be asked to return to the room and the advisor will inform him/her of the committee´s determination. If the student´s proposal and its oral presentation and defense are deemed satisfactory, the committee members will sign an approval sheet (see the *Manual of the Biomedical Sciences Graduate Program* for details on the contents and format for this sheet), which will then need to be turned in along with

a printed copy of the proposal at the Division of Graduate Studies. Passing of the Written Qualifying Examination and obtaining the committee´s approval of the Dissertation Proposal make the student eligible to register in the Doctoral Dissertation Research course, ANAT 8599, and become an official candidate to obtain the PhD in Anatomy.

The committee may postpone the signing of the approval sheet if they deem necessary that the student makes changes and corrections to the written proposal, and/or if they think the student´s oral presentation and defense were not satisfactory. In the former case, the approval sheet is to be signed upon providing evidence of completion of the requested changes to the written proposal. In the latter case, the student would have one more opportunity, in no more than 60 calendar days, to repeat the oral presentation and defense and obtain the final approval of the proposal from the committee members. Failure to achieve this approval after a second oral presentation and defense of the proposal will automatically result in dismissal from the graduate program.

10) Dissertation Defense: Upon completion of the research project and writing of the Doctoral Dissertation, the student (PhD candidate) and advisor will establish a date for the defense of the dissertation which should be held no later than six (6) calendar years from the date of initial registration in the Graduate Program of the Department of Anatomy and Neurobiology, and no less than two (2) months prior to the intended date of graduation. Written communication of this date will be sent by the student to the Department Chair, to the Division of Graduate Studies, and to the members of the student's Dissertation Committee who are responsible for evaluating the Doctoral Dissertation and its oral defense (see below, "Procedure for Completion of a Thesis or Dissertation").

11) Expected Time-line: The PhD program is designed for completion in 6 years. Required coursework (other than the Dissertation Research credits) is to be completed no later than the end of the 1st semester of the 3rd academic year. A dissertation research advisor is to be selected and a dissertation committee appointed and then approved by the school´s Graduate Studies Committee no later than the end of the 2nd academic year (July 31st). The Qualifying Exam must be taken and passed no later than the end of the 3rd academic year (July 31st). The proposal for the Dissertation research project is to be presented to and approved by the dissertation committee no later than the end of the 4th academic year (July 31st). The Dissertation defense is to be held no later than the 2nd semester of the 6th academic year, and the approved final version of the Dissertation must be turned in at the office of the school´s Graduate Program no later than May of the 6TH academic year. The recommended curricular sequence for the PhD Program is as follows *(assuming all courses are available each year; marked in red are required activities not linked to course credits)*:

First Year: 24 Credits

ANAT 8532	Seminar and Journal Club I	1
ANAT 8411	Human Gross Anatomy I	4
ANAT 8513	Human Embryology I	1
ANAT 8611	Human Neuroanatomy and Neuroscience I	2
ANAT 8613	Human Cell Biology and Histology I	2

ANAT 8412	Human Gross Anatomy II	4
ANAT 8514	Human Embryology II	1
ANAT 8612	Human Neuroanatomy and Neuroscience II	3
ANAT 8613	Human Cell Biology and Histology II	2
ANAT 8532	Seminar and Journal Club II	1
ANAT 8996*	Research Laboratory Rotation	3

**elective course*

Second Year: 19 or 20 Credits

ANAT 8526	Practice in Teaching	3
ANAT 8532	Seminar and Journal Club III	1
BCHM 8511*	Biochemistry I	3
FISA 8605*	Basic Concepts on Human Physiology	3
CBIO 8500	Statistics for the Biomedical Sciences	3

**or equivalent recommended course authorized by the Department*

ANAT 8525/6	Practice in Teaching	2 (or 3)
ANAT 8532	Seminar and Journal Club IV	1
ANAT 8996**	Research Laboratory Rotation	3

**elective course*

Selection of Dissertation Research Advisor
Appointment and Approval of Dissertation Committee

Third Year: 6 Credits

CBIO 8991*	Bioethics I: Fundamentals	1

**elective course*

Research in Advisor`s Laboratory
Development of Dissertation Project Specific Aims

CBIO 8992*	Bioethics II: Applied Principles	2
ANAT 8596*	Thesis Proposal Preparation	3

**elective course*

Research in Advisor`s Laboratory
First Dissertation Committee Meeting
Taking and Passing Qualifying Exam

Fourth Year: 15 Credits

ANAT 8596	Thesis Proposal Preparation	Continuation

Presentation and Approval of Thesis Proposal
Research in Advisor`s Laboratory

ANAT 8599	Doctoral Dissertation Research	15

Fifth Year: 0 Credits

ANAT 8599	Doctoral Dissertation Research	Continuation

Sixth Year: 0 Credits

ANAT 8599	Doctoral Dissertation Research	Continuation
	Presentation and Defense of Doctoral Dissertation	

Failure to fulfill the expected time limits will be grounds for placing the student on probation, with a maximum of one subsequent academic session (semester or summer) to comply with the missed deadline. If after the probationary period the student has still not complied with the program`s time limit requirements, this will be grounds to be automatically dismissed. Failure to fulfill more than one expected time limit will be grounds for automatic dismissal from the program.

Any changes or extensions to these time limits, due to special and justified circumstances, would need to be discussed in advance with the dissertation advisor and committee, and with the Chair of the Department and the Coordinator of the Anatomy Graduate Program. In the event the requested changes were deemed to be justified and workable within the parameters of the *Manual of the Biomedical Sciences Graduate Program* and the campus *Manual of the Registrar*, they would ultimately need to be presented to the Faculty of the department for their approval and subsequent ratification by the Division of Graduate Studies of the Associate Deanship for Biomedical Sciences of the School of Medicine.

7) Concurrent Doctor of Medicine/Doctor of Philosophy (MD/PhD) Program

The purpose of the Concurrent MD/PhD program in the Department of Anatomy and Neurobiology is to train medical students to perform scholarly research in anatomical and/or neurobiological disciplines. As part of this program, students will be trained to evaluate and conduct anatomical and/or neurobiological research and report research results. The program of study runs concurrently with the requirements for the Doctor of Medicine degree. The student must first be admitted to both programs, MD and PhD, and will usually begin with the Medical curriculum. After completing the first two years of medicine (primarily basic science courses) and taking and passing the USMLE Step 1 examination, the student will then begin the graduate program portion of the training. After completing coursework requirements, an advisor and committee will be selected, and the student will continue with the same training trajectory as a regular PhD student. Once the PhD requirements are fulfilled, including presentation and approval of the dissertation, the student will return to the Medical curriculum to complete the 3rd and 4th year clinical rotations.

Program of Study

1) Residency Requirement: In addition to the requirements of the MD degree, the Doctorate in Philosophy Degree program of the Department of Anatomy and

Neurobiology shall require a minimum of two (2) calendar years (24 months) in residence at the University of Puerto Rico.

2) Time Limits: The Qualifying Examination must be taken within three (3) calendar years after the date of beginning the graduate program portion of their training (usually after completing the first two years of the Medicine curriculum), and the Dissertation Defense must be held within six (6) calendar years after beginning the graduate program. Courses to be credited toward the Doctoral degree must have been taken within seven (7) calendar years prior to the granting of the degree.

3) Selection of Advisor and Committee: The student must identify a dissertation advisor and committee by the end of the first year after the date of beginning the graduate program portion of their training (usually after completing the first two years of the Medicine curriculum) (see the Manual of Requirements and Regulations of the Division of Graduate Studies for details on requirements and procedures to be followed).

4) Course Requirements: At least sixty-four (64) credit hours of graduate level courses must be completed with an overall average of B (80%) or better. Of these, fifteen (15) will be in Dissertation Research (ANAT 8599). Students must obtain a grade of B (80%) or better in all core Anatomy & Neurobiology (departmental) courses, and must maintain a minimum GPA of 3.0. Students whose GPA drops below 3.0 will be placed on probation and will have a maximum of one year to bring their grades up to fulfill the 3.0 requirement. If the GPA remains below 3.0 after the probation period, the student will be automatically dismissed from the program.

At the discretion of the Anatomy and Neurobiology Graduate Committee, credit towards the Ph.D. degree may be received for courses taken for the Doctor of Medicine degree. The courses that may be co-validated to meet the requirements for the PhD degree are the medical school equivalents of ANAT 8411-8412, ANAT 8513-8514, ANAT 8611-8612, ANAT 8613-8614, FISA 8605, and BCHM 8511. To receive credit for the corresponding courses taken for the Doctor of Medicine degree, a student must comply with the same minimum grade requirements for the PhD Program (B (80%) or better for departmental courses, C (70%) or better for other courses) in each of the courses and the approval of the Department Chair. To obtain co-validation for the anatomy courses, a student must also comply with additional course requirements such as the writing of papers on Gross Anatomy, Embryology, Cell Biology/Microscopic Anatomy, and Neuroscience. The course coordinator of each corresponding graduate course will plan with the student how he or she will comply with these additional graduate course requirements. The conditions for co-validation of the two physiology courses and the biochemistry course will also be determined by the Anatomy and Neurobiology Graduate Committee and/or the Department Chair.

Assuming full credit is received for the corresponding courses taken for the Doctor of Medicine Degree, additional required courses for the Combined Doctor of Medicine/Doctor of Philosophy in Anatomy Degree are:

Course No.	Title	Credits

ANAT 8526	Practice in Teaching	3
ANAT 8525 or 8526	Practice in Teaching	2 or 3
ANAT 8532	Seminar and Journal Club (four semesters)	4
ANAT 8528, 8591, 8593, 8596, 8996 CBIO 8991, 8992, 8506	Electives*	12
CBIO 8500	Statistics for the Biomedical Sciences	3
ANAT 8599	Dissertation Thesis Research	15
	Total	39-40

Students will be encouraged to take other courses relevant to their program offered by other departments.

5) Practice in Teaching: All graduate students in the Department of Anatomy and Neurobiology are expected to assist in the teaching program of the Department. In general, each Doctoral degree candidate will be expected to assist in one (1) course per year, for a minimum of two years, as assigned by the Department Chair. The responsibilities of the teaching assistant and manner of evaluation are discussed above under the Program of Study for the PhD degree.

6) Language Requirement: The graduate student needs a full working knowledge (i.e. reading, writing and speaking) of English. Knowledge of other languages is desirable, but there is no additional language requirement set by the Department.

7) Developing Specific Aims of Dissertation Project: During the 6 months immediately following the selection of the Advisor, the student is expected to establish the focus of the Dissertation Research and develop the specific aims and general background, significance, and outline of the project, in consultation and with the assistance of the Advisor. During these 6 months, and no later than the end of the 1st semester of the 3rd academic year, the student will convene a Dissertation Committee Meeting to present its members these aims and basic elements of the project with the intention of receiving input and suggestions and obtaining their approval to initiate preliminary work on the Dissertation Proposal. The establishment of these aims and core structure of the project will also serve as the basis for designing the Qualifying Examination. On this first, and subsequent meetings with the Dissertation Committee, a form known as Appendix E (see the *Manual of the Biomedical Sciences Graduate Program* for details) must be filled out summarizing the issues presented and discussed and the agreements reached during the meeting, and including the signatures of the student, Dissertation Advisor and the members of the Dissertation Committee. The Dissertation Committee must meet at least once each year, and the original and signed Appendix E form for each meeting must be turned in to the Associate Deanship for Biomedical Sciences, also sending a copy to the Coordinator of the Graduate Program in Anatomy and the Department Chair.

8) Dissertation Requirement: The purpose of obtaining a PhD degree from the Department of Anatomy and Neurobiology is to become proficient in various aspects

of experimental scientific research. Thus, the dissertation forms an integral part of the Doctoral program. Research for the dissertation will be done under the supervision of a qualified advisor. It is expected that the creative and technical work involved, as well as the analysis and interpretation of the data collected will be the work of the student. The dissertation is expected to report the results of original research in Anatomy and/or Neurobiology, and be of a quality that makes it suitable for publication in peer-reviewed journals within the field of interest. A PhD degree research project should be one that can be completed in approximately three years, with the expectation of publishing its results in at least 2-3 original research articles in peer-reviewed scientific journals. It is expected that the student, with the aid of the advisor, submits at least one (preferably 2-3) manuscript(s) for publication in such journals before graduating from the PhD program.

9) Developing Specific Aims of Dissertation Project: During the 6 months immediately following the selection of the Advisor, the student is expected to establish the focus of the Dissertation Research and develop the specific aims and general background, significance, and outline of the project, in consultation and with the assistance of the Advisor. During these 6 months, and no later than the end of the 1st semester of the 3rd academic year within the graduate program, the student will convene a Dissertation Committee Meeting to present its members these aims and basic elements of the project with the intention of receiving input and suggestions and obtaining their approval to initiate preliminary work on the Dissertation Proposal. The establishment of these aims and core structure of the project will also serve as the basis for designing the Qualifying Examination. On this first, and subsequent meetings with the Dissertation Committee, a form known as Appendix E (see the *Manual of the Biomedical Sciences Graduate Program* for details) must be filled out summarizing the issues presented and discussed and the agreements reached during the meeting, and including the signatures of the student, Dissertation Advisor and the members of the Dissertation Committee. The Dissertation Committee must meet at least once each year, and the original and signed Appendix E form for each meeting must be turned in to the Associate Deanship for Biomedical Sciences, also sending a copy to the Coordinator of the Graduate Program in Anatomy and the Department Chair.

10) Doctoral Written Qualifying Examination: The main purpose of the qualifying examination is to assess the extent to which each student has mastery and the ability to synthesize, integrate, and apply core knowledge in the chosen field of specialization, and to gauge the students' readiness for developing, conducting, and completing an independent experimental research project that will produce significant new knowledge with high probability of publication in relevant bona fide peer-reviewed scientific journals. The examination uses a take-home format, and is designed to assess the student´s ability to:
    - identify, understand, recall, and draw appropriate conclusions from the relevant scientific literature;
    - identify significant questions and gaps in knowledge in a specific field;
    - design suitable and original research strategies and experimental plans to test specific hypotheses;
    - know and understand the principles and guidelines underlying good research practices necessary to secure solid scientific rigor;

- communicate clearly and effectively in writing; amongst other research skills.

The Written Qualifying Examination shall be given after the student has completed all course requirements (with the exception of ANAT 8599) and after the Dissertation research project´s specific aims and core structure have been established and approved by the Dissertation Committee. The examination must be taken and passed no later than the end of the 3rd academic year since initiating in the graduate program (July 31st).

The Dissertation Committee will prepare and administer the written Qualifying Examination, which shall focus on those areas of study relevant to the proposed field of research. Each committee member, including the advisor, will prepare 2 questions, and of the total 10 questions (or 12 in the case of Dissertation Committees with 6 members), the student must answer a minimum of 6 questions, selecting at least one question from each committee member. The committee members may leave it up to the student to decide which of their two questions they will answer, or they may identify one of the questions as mandatory and the other one as optional. It will be the responsibility of the Dissertation Research Advisor to provide the members of the committee with specific guidelines on how to prepare their questions, and to provide the student with specific guidelines to complete the examination.

The student will have 10 calendar days to complete the examination, with the understanding that during that period of time he/she may not talk or consult with anyone other than the members of the committee regarding any aspect or content of the exam. A minimum grade of 80% in the overall exam (average of the grades of the 6 questions the student answers) must be obtained, also having a minimum grade of 80% in at least 4 of the 6 questions that are answered to pass the exam. The student's advisor will have up to 5 calendar days to send each committee member the student´s response(s), and each committee member will have up to 14 calendar days to read, evaluate, and grade the student´s answer(s), and will inform the advisor in writing of these results within that same time period. A formal letter informing of the results obtained in the Written Qualifying Examination must be prepared and sent via e-mail to the student by the advisor, with copies to the Chair of the Department of Anatomy and Neurobiology and the Coordinator of the Graduate Program in Anatomy, no later than 21 calendar days upon the student´s completion of the exam. The Chair of the Department of Anatomy and Neurobiology and the Coordinator of the Graduate Program in Anatomy will in turn notify the Coordinator of the School of Medicine´s Graduate Program, and the Associate Dean for Biomedical Sciences of the student´s performance in the exam.

If the student fails the Qualifying Examination, he/she will be required to take a second examination with new questions within the next 60 calendar days. The Qualifying Examination may be repeated only once following a first unsuccessful attempt. Failure to pass a second examination will automatically result in dismissal from the Doctoral graduate program. At the discretion of the Dissertation Research Advisor, and with the approval of the Chair and Faculty of the Department, the student may be given the opportunity to transfer to the Master´s Degree program, only if he/she is

capable of fulfilling the requirements to complete the MS degree in Anatomy no later than December 31 of the student´s 4th academic year.

11) Dissertation Proposal: After passing the Written Qualifying Examination, the student will write a dissertation research proposal and will present and defend it orally, no later than the end of the 4th academic year since initiating the graduate program (July 31st). The proposal should be developed with the Advisor, in consultation with committee members, using the specific aims, general background and significance, and outline of the project that were approved earlier (see #7 above). After obtaining the approval of the Advisor, the student will provide the written proposal to the members of the dissertation committee with sufficient time prior to its oral presentation (~3-4 weeks in advance). On the date of the proposal´s oral presentation and defense, the student will be expected to answer questions from the members of the committee, including the advisor. He/she will then be asked to step outside of the room and the committee will discuss and evaluate as a group the quality of the student´s performance during the oral defense as well as on the written document. Following this process, the student will be asked to return to the room and the advisor will inform him/her of the committee´s determination. If the student´s proposal and its oral presentation and defense are deemed satisfactory, the committee members will sign an approval sheet (see the *Manual of the Biomedical Sciences Graduate Program* for details on the contents and format for this sheet), which will then need to be turned in along with a printed copy of the proposal at the Division of Graduate Studies. Passing of the Written Qualifying Examination and obtaining the committee´s approval of the Dissertation Proposal make the student eligible to register in the Doctoral Dissertation Research course, ANAT 8599, and become an official candidate to obtain the PhD in Anatomy.

    The committee may postpone the signing of the approval sheet if they deem necessary that the student makes changes and corrections to the written proposal, and/or if they think the student´s oral presentation and defense were not satisfactory. In the former case, the approval sheet is to be signed upon providing evidence of completion of the requested changes to the written proposal. In the latter case, the student would have one more opportunity, in no more than 60 calendar days, to repeat the oral presentation and defense and obtain the final approval of the proposal from the committee members. Failure to achieve this approval after a second oral presentation and defense of the proposal will automatically result in dismissal from the graduate program.

12) Dissertation Defense: Upon completion of the research project and writing of the Doctoral Dissertation, the student (PhD candidate) and advisor will establish a date for the defense of the dissertation which should be held no later than six (6) calendar years from the date of initial registration in the Graduate Program of the Department of Anatomy and Neurobiology, and no less than two (2) months prior to the intended date of graduation. Written communication of this date will be sent by the student to the Department Chair, to the Division of Graduate Studies, and to the members of the student's Dissertation Committee who are responsible for evaluating the Doctoral Dissertation and its oral defense (see below, "Procedure for Completion of a Thesis or Dissertation").

13) Expected Time-line: The MD/PhD program is designed for completion in 10 years. Required graduate coursework (other than the Dissertation Research credits) is to be completed no later than the end of the 1st semester of the 3rd academic year after having initiated in the graduate program. A dissertation research advisor is to be selected and a dissertation committee appointed and then approved by the school´s Graduate Studies Committee no later than the end of the 2nd graduate academic year (July 31st). The Qualifying Exam must be taken and passed no later than the end of the 3rd graduate academic year (July 31st). The proposal for the Dissertation research project is to be presented to and approved by the dissertation committee no later than the end of the 4th graduate academic year (July 31st). The Dissertation defense is to be held no later than the 2nd semester of the 6th graduate academic year, and the approved final version of the Dissertation must be turned in at the office of the school´s Graduate Program no later than May of the 6th graduate academic year. The recommended curricular sequence for the MD/PhD Program is as follows (*(assuming all courses are available each year; marked in red are required activities not linked to course credits):*

(Year 1) First Medical Year:

(Year 2) Second Medical Year:

Taking and passing USMLE Step 1 Exam

(Year 3) First Graduate Year: 24 Credits

ANAT 8532	Seminar and Journal Club I	1
ANAT 8411	Human Gross Anatomy I	4
ANAT 8513	Human Embryology I	1
ANAT 8611	Human Neuroanatomy and Neuroscience I	2
ANAT 8613	Human Cell Biology and Histology I	2
ANAT 8412	Human Gross Anatomy II	4
ANAT 8514	Human Embryology II	1
ANAT 8612	Human Neuroanatomy and Neuroscience II	3
ANAT 8613	Human Cell Biology and Histology II	2
ANAT 8532	Seminar and Journal Club II	1
ANAT 8996*	Research Laboratory Rotation	3

**elective course*

(Year 4) Second Graduate Year: 19 or 20 Credits

ANAT 8526	Practice in Teaching	3
ANAT 8532	Seminar and Journal Club III	1
BCHM 8511*	Biochemistry I	3
FISA 8605*	Basic Concepts on Human Physiology	3
CBIO 8500	Statistics for the Biomedical Sciences	3

**or equivalent recommended course authorized by the Department*

ANAT 8525/6	Practice in Teaching	2 (or 3)
ANAT 8532	Seminar and Journal Club IV	1
ANAT 8996** *elective course	Research Laboratory Rotation	3
	Selection of Dissertation Research Advisor Appointment and Approval of Dissertation Committee	

(Year 5) Third Graduate Year: 6 Credits

CBIO 8991* *elective course	Bioethics I: Fundamentals	1
	Research in Advisor`s Laboratory Development of Dissertation Project Specific Aims	
CBIO 8992* *elective course	Bioethics II: Applied Principles	2
ANAT 8596* *elective course	Thesis Proposal Preparation	3
	Research in Advisor`s Laboratory First Dissertation Committee Meeting Taking and Passing Qualifying Exam	

(Year 6) Fourth Graduate Year: 15 Credits

ANAT 8596	Thesis Proposal Preparation Presentation and Approval of Thesis Proposal Research in Advisor`s Laboratory	Continuation
ANAT 8599	Doctoral Dissertation Research	15

(Year 7) Fifth Graduate Year: 0 Credits

ANAT 8599	Doctoral Dissertation Research	Continuation

(Year 8) Sixth Graduate Year: 0 Credits

ANAT 8599	Doctoral Dissertation Research Presentation and Defense of Doctoral Dissertation	Continuation

(Year 9) Third Medical Year:

(Year 10) Fourth Medical Year:

Failure to fulfill the expected time limits will be grounds for placing the student on probation, with a maximum of one subsequent academic session (semester or summer)

to comply with the missed deadline. If after the probationary period the student has still not complied with the program`s time limit requirements, this will be grounds to be automatically dismissed. Failure to fulfill more than one expected time limit will be grounds for automatic dismissal from the program.

Any changes or extensions to these time limits, due to special and justified circumstances, would need to be discussed in advance with the dissertation advisor and committee, and with the Director and Coordinator of the Anatomy Graduate Program. In the event the requested changes were deemed to be justified and workable within the parameters of the *Manual of the Biomedical Sciences Graduate Program* and the campus *Manual of the Registrar*, they would ultimately need to be presented to the Faculty of the department for their approval and subsequent ratification by the Division of Graduate Studies of the Associate Deanship for Biomedical Sciences of the School of Medicine.

8) Procedure for Selecting and Managing Thesis and Dissertation Committees

1) A Master's Thesis Committee will consist of at least three (3) faculty members, two (2), including the Advisor from the Department, and one (1) from outside the Department.

2) The Doctoral Dissertation Committee will consist of at least five (5) faculty members, at least three (3), including the Advisor from the Department, and at least one (1) from outside the Department.

3) The student and advisor select the members of the Thesis or Dissertation Committee.

4) The student will invite, in writing, the selected faculty members to participate in the Thesis or Dissertation Committees.

5) The selected faculty members will send their written acceptance or refusal of this invitation to the student, who will forward them to the Graduate Program Coordinator and to the Department Chair.

6) The Graduate Program Coordinator will then officially inform the Division of Graduate Studies of the proposed composition of the student's Thesis or Dissertation Committee and request their approval. The committee will become official only upon the approval of the Division of Graduate Studies.

7) The Thesis or Dissertation Committee will be responsible for approval of the Thesis or Dissertation Proposal, guiding the student when necessary during the research, and for conducting the Thesis Examination, or Doctoral Qualifying Examination and Dissertation Defense.

8) The Advisor and members of the Thesis or Dissertation Committee will certify the final copies of the Thesis or Dissertation before it is submitted to the Division of Graduate Studies as partial fulfillment for the degree.

9) Procedure for the Completion of a Thesis or Dissertation

1) No later than the first semester of the second year of a Master's program or the third year of a Doctoral program, students must select their areas of research and establish an advisor-advisee relationship with a qualified* faculty member of the Department.

2) After consultation with the Advisor about various potential research topics, a specific research project should be delimited.

3) A Thesis or Dissertation research proposal should be submitted in writing to the student's Thesis or Dissertation Committee.

4) When the written Thesis or Dissertation research proposal has been approved by the Thesis or Dissertation Committee, a copy will be filed in the Division of Graduate Studies. Changes in the proposed research will be allowed only with the approval of the candidate's Thesis or Dissertation Committee.

5) The candidate will proceed with research, as described in the written Thesis or Dissertation research proposal, consulting with the Committee whenever necessary, at least once every year.

6) The candidate will distribute readers' copies of the Thesis or Dissertation to members of the Committee at least four (4) weeks prior to the date of the Thesis Examination for Master's candidates or the Dissertation Defense for Doctoral candidates. If less time is to be provided, written authorization from all the members of the Committee is required, and the minimum amount of time to be provided is two (2) weeks.

7) The date of the Thesis Examination or Dissertation Defense will be established by the candidate and advisor, in consultation with the Department Chair. The student must email the Thesis Committee members to decide on a date based on their availability. Once all the committee members respond to the email, it must be forwarded to the Coordinator of the Program and the Department Chair. The Chair will then notify, in writing, the selected date and time to the Division of Graduate Studies and the members of the student's Thesis or Dissertation Committee.

8) The candidate's Thesis or Dissertation Committee will conduct the Thesis Examination or Dissertation Defense. A majority vote of the Committee will be required for approval of the Thesis or Dissertation.

* See "Manual of Requirements and Regulations of the Division of Biomedical Sciences & Graduate Studies toward the Master of Science and Doctor of Philosophy Degrees (October 2013), Appendix B: Obligations and Required Qualifications of Members of Thesis/Dissertation Committees."

9) Five (5) bound copies of the approved Thesis or Dissertation will be distributed according to the regulations of the Division of Graduate Studies.

10) Graduate Courses in the Department of Anatomy and Neurobiology

ANAT 8411 Human Gross Anatomy I – 4 credits

Offered yearly. The course provides students with a basic understanding of the organization and three-dimensional gross structure of the human body, with emphasis on the relation between structure and function. At the end of the course, the student will have acquired knowledge of the segmental and compartmental organization of the human body, the basic organization and morphology of the vascular and lymphatic systems of the following regions of the body: body wall, limbs, and the organs of the thoracic cavity. The student will also understand surface anatomy and various imaging modalities. In the laboratory the student will conduct dissection of these regions of a human cadaver, identifying and describing the structures and their relations to each other. The structured time of the course includes conferences, laboratory dissection and small group discussions.

ANAT 8412 Human Gross Anatomy II – 4 credits

The course provides students with a basic understanding of the organization and three-dimensional gross structure of the human body, with emphasis on the relation between structure and function. At the end of the course, the student will have acquired knowledge of the segmental and compartmental organization of the human body, the basic organization and morphology of the vascular and lymphatic systems of the following regions of the body: abdomen, pelvis, perineum, neck, and head. The student will also understand surface anatomy and various imaging modalities of these regions. In the laboratory the student will conduct dissection of these regions of a human cadaver, identifying and describing the structures and their relations to each other. The structured time of the course includes conferences, laboratory dissection and small group discussions.

ANAT 8513 Human Embryology I – 1 credit

Offered yearly. Through interactive conferences, the student will acquire foundational knowledge on the mechanisms of development of the human body, from a clinical and structural perspective. This course will provide the student with an understanding of the process of gametogenesis, and the stages of the prenatal period of development of the human body between fertilization and embryonic development through the end of the 8th prenatal week, followed by the stages of fetal development of the integumentary, nervous, musculoskeletal, cardiovascular, and respiratory systems. The student will also learn about the major abnormalities that can occur during development which can result in congenital malformations.

ANAT 8514 Human Embryology II – 1 credit

Offered yearly. Through interactive conferences, the student will acquire foundational knowledge on the mechanisms of development of the human body, from a clinical and structural perspective. This course will provide the student with an understanding of the process of the stages of fetal development of the gastrointestinal, urogenital, endocrine/reproductive systems, and of the structures of the head and neck. The student will also learn about the major abnormalities that can occur during development of these structures and systems which can result in congenital malformations. The second half of the course will focus on teaching basic concepts of developmental biology.

ANAT 8611 Human Neuroanatomy and Neuroscience I – 2 credits

Offered yearly. The course includes a global introduction on the central and peripheral nervous system, from the clinical and structural perspective, followed by the study of the structure, function, myelination and metabolism of individual nerve cells, their interconnections and the process of synaptic transmission, neurotransmitters and receptors, the anatomy, organization and function of the spinal cord, including all its ascending, descending and local tracts, culminating with a global look at the organization and functioning of the peripheral nervous system. These topics are reinforced by clinical correlation conferences and small group discussion sessions in which physicians and scientists present material related to basic neurosciences topics. The structured component of the course will be offered through conferences and small group discussions.

ANAT 8612 Human Neuroanatomy and Neuroscience II – 3 credits

Offered yearly. The course includes the study of the meninges, venous and arterial circulation of the central nervous system (CNS), gross brain anatomy, including the structures and regions of the telencephalon, diencephalon, midbrain, and metencephalon, function and connectivity amongst CNS structures, the organization and function of the motor and somatosensory systems and of the special senses, and the cortex and higher-order functions. These topics are reinforced by demonstrations of neuroanatomy in human brains, clinical correlation conferences and small group discussion sessions in which physicians and scientists present material related to these basic neurosciences topics. The structured component of the course will be offered through conferences, demonstrations of neuroanatomy, and small group discussions.

ANAT 8613 Human Cell Biology and Histology I – 2 credits

Offered yearly. Through conferences and microscopy discussion sessions, the student will receive an introduction on the structure and function of the cell and the microscopic anatomy of the following human tissues and organs: skin, epithelium, connective, neural, cartilage, bone, muscle, vessels of the circulatory system, blood, lymph, respiratory and urinary. Emphasis will be placed on correlating the arrangement and structure of

cells with function and physiology of the tissue/organ. Upon completion of the course it is expected that the student will have: (1) knowledge of the normal microscopic structure of the cells, tissues, and organs of the human body; and (2) the ability to correlate structure and function in cells, tissues, and organs at both light and electron microscopic levels.

ANAT 8614 Human Cell Biology and Histology II – 2 credits
Offered yearly. Through conferences and microscopy discussion sessions, the student will receive an introduction on the structure and function of the cell and the microscopic anatomy of the following human tissues and organs: gastrointestinal system with its associated organs, endocrine and reproductive (male and female) systems, eye, and ear. Emphasis will be placed on correlating the arrangement and structure of cells with function and physiology of the tissue/organ. Upon completion of the course it is expected that the student will have: (1) knowledge of the normal microscopic structure of the cells, tissues, and organs of the human body; and (2) the ability to correlate structure and function in cells, tissues, and organs at both light and electron microscopic levels.

ANAT 8525 Practice in Teaching – 2 credits.
Offered yearly. Supervised teaching experience in lab and lecture components of ANAT 8504, 8505, or 8528, MPRI 7117 (Medical Histology) or 7136 (Medical Neuroscience), CBIO 7130 (Dental Neuroanatomy). Prerequisites: ANAT 8501, 8503, 8504, 8505.

ANAT 8526 Practice in Teaching – 3 credits.
Offered yearly. Supervised teaching experience in ANAT 8501, MPRI 7140 (Medical Gross Anatomy & Embryology), CBIO 7110 (Dental Gross Anatomy). Prerequisites: ANAT 8501, 8503, 8504, 8505.

ANAT 8528 Topics in Anatomy – 1 to 3 credits by arrangement.
Offered by consent of instructor. This course provides graduate students with a means of obtaining credit for concentrated specialized courses of 18-54 clock hours in duration. Prerequisites: ANAT 8501, 8503, 8504, 8505.

ANAT 8532 Seminar and Journal Club – 1 credit
Offered at least once per semester. Program and hours to be arranged. The course provides students the experience of reading, presenting and discussing original articles from peer-reviewed scientific journals under the guidance and supervision of a Department faculty member. The articles may be selected by the course coordinator and/or the students. Also, the topic of the selected articles may be variable or they may all be related to a common field of interest or research problem. Students may also be expected to attend selected seminar presentations to later discuss them critically.

ANAT 8591 Special Problems in Anatomy – 1 credit.
Offered by consent of instructor. This course provides a means during an academic session (semester or summer) by which students may pursue relatively short special research projects that include laboratory work under the supervision of and through special arrangements with a department faculty member.

ANAT 8593 Special Problems in Anatomy – 3 credits.
Offered by consent of instructor. This course provides a means during an academic session (semester or summer) by which students may pursue relatively long special research projects that include laboratory work under the supervision of and through special arrangement with a department faculty member.

ANAT 8595 Master's Thesis Research – maximum of 6 credits.
Prerequisite: Completion of departmental required courses and successful presentation and approval of the Thesis Proposal
Laboratory research work for Master´s Thesis.

ANAT 8596 Thesis Proposal Preparation – 3 credits
Offered by consent of instructor. This course offers essential information for the preparation of thesis or dissertation proposals integrating basic concepts of anatomical disciplines, theories and research strategies. Topics to be discussed include the development of specific aims, literature revision to develop a rationale and hypothesis for the proposal, analysis of preliminary results, and design of research methodology to evaluate the problems to be investigated. The central focus of the course will be to train students in writing of thesis or dissertation proposals, as well as applications for predoctoral fellowships from federal, private or public entities. In addition, potential pitfalls of proposed research will be discussed.

ANAT 8599 Doctoral Dissertation Research – maximum of 15 credits
Prerequisite: Completion of departmental required courses and successful presentation and approval of the Dissertation Proposal and completion of the Department of Anatomy & Neurobiology Doctoral Qualifying Examination.
Laboratory research work for Doctoral Dissertation.

ANAT 8995 Practice in Dissection – 1 to 3 credits by arrangement
Offered by consent of instructor. The purpose of this course is to provide the student the opportunity to carry out the dissection of a human cadaver with more time and more emphasis on attention to details and the organization of structures and the development of advanced dissection skills than what is possible during the basic human gross anatomy course. At the end of the course, the student will not only have strengthened his or her knowledge of the anatomy of the human body, but will also be better prepared to teach this discipline, particularly in courses requiring dissection. The student will dissect a human cadaver in an independent manner, following the

guidelines and instructions provided by the course coordinator, who will also provide assistance and direct supervision in the laboratory at periodic times and/or as is required by each student.

ANAT 8996 Research Laboratory Rotation – 1 to 3 credits by arrangement
Offered by consent of instructor. The course offers students the opportunity of working for specific periods of time in one or various research laboratories of the Department of Anatomy and Neurobiology, with the goal of learning first-hand about projects, types of experiments, experimental techniques, animal models, and work styles and dynamics of different laboratories and investigators. The purpose is also that both students and investigators get an idea of their options for developing what eventually will become new master´s thesis or doctoral dissertation projects.