

Howard University Graduate Program in Anatomy Handbook

August 2020

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Preface

Welcome to the Howard University Graduate Program in Anatomy. The purpose of this handbook is to guide you through the steps of obtaining a graduate degree in Anatomy and to explain the organization of our program. The handbook outlines the rules and regulations of the degree process. Most of the basic rules are policies of the Howard University Graduate School and must be followed by all programs offering graduate degrees. Additionally, more specific requirements were established by the Graduate Committee of the Program in Anatomy (Graduate Program Committee) to ensure the quality of your training. As questions arise, good sources of information are the Director(s) of the Graduate Program in Anatomy and members of the Graduate Program Committee.

The most significant component of your training will be the experience of designing, performing, and evaluating your thesis (M.S.) and dissertation (Ph.D.) research. Courses will offer a valuable opportunity to discuss the fundamentals of anatomy with established investigators, and to learn how to approach and evaluate the scientific literature. An important goal of the faculty will be to teach you how to take responsibility for your own education. As a scientist, you must decide what you need to know, determine how to learn it, and pursue the information aggressively - in the classroom, library, or laboratory.

Graduate students in the Graduate Program in Anatomy at Howard University are expected to develop several skills as they start to embark on their thesis research. Students will learn the ability to synthesize and critically evaluate data described in the scientific literature, formulate clearly testable hypotheses, design experiments to test these hypotheses and subsequently evaluate results from proposed experiments. These skills will be developed through didactic coursework, participation in journal clubs and seminar series and laboratory rotations.

We are pleased that you have chosen to pursue your research training at Howard University. Best of luck as you begin your scientific career.

The Program

The Howard University Graduate Program in Anatomy is located in the Department of Anatomy in the College of Medicine and offers graduate training leading to the M.S. and Ph.D. degrees. A combined M.D./Ph.D. program is also available; applicants to this program must be admitted to both the College of Medicine and the Graduate Program in Anatomy. The Graduate Program in Anatomy is part of the Howard University Graduate School's rich tradition of academic excellence and its current Master and Ph.D. program offerings in more than 30 disciplines and approximately 100 specializations. Being located in Washington, DC, one of the world's most powerful and dynamic cities, provides an added dimension to graduate education at Howard University.

The purpose of the Howard University Graduate Program in Anatomy is to provide formal master's and doctoral education in contemporary Anatomy. The six principal foci of the Program are:

- 1) Molecular, Cell & Developmental Biology
- 2) Neuroscience
- 3) Evolutionary & Organismal Biology
- 4) Epigenetics and Aging
- 5) Evolutionary Developmental Biology
- 6) Paleobiology

In keeping with the diverse nature of current approaches included within the realm of Anatomy, the Howard University Graduate Program of Anatomy transcends traditional departmental boundaries. Students in the program complete a series of core Anatomy courses and other requirements and pursue research in the laboratory of one of the department's Graduate Faculty members. In addition, opportunities are available for collaboration with scientists in other departments at Howard University and at other universities in the local area as well as with scientists at the National Institutes of Health (NIH), the National Naval Medical Center, the Smithsonian Institution, the Food and Drug Administration (FDA), and the United States Department of Agriculture.

The philosophy of the Howard University Graduate Program in Anatomy is to provide students with ample opportunities - to explore a broad range of topics within anatomy, to develop creative and critical thinking skills, to acquire technical expertise in the latest anatomical technologies, and to learn to become articulate communicators - and to give students the flexibility to design programs that address individual strengths and weaknesses as they take advantage of these opportunities. Students participate in teaching, in graduate seminars, and in the departmental seminar series. Financial aid, in the form of graduate traineeships and fellowships, is available for some of our students. The Graduate Program in Anatomy prepares students for careers in research and teaching in the anatomical and life sciences, with emphasis on an integrative understanding of biological systems at levels ranging from the molecular to the organismal. The goal is to generate anatomists who will be competitive in the academic, industrial, and/or government job markets of the coming decades.

Administration of the Program

The Graduate Committee of the Program in Anatomy (Graduate Program Committee) is charged with administration of the Program (reporting to the Dean of the Graduate School). The Graduate Program Committee consists of at least four members of the Graduate Faculty of the Department of Anatomy. The Chairperson of the Department of Anatomy appoints the Director(s) of the Graduate Program in Anatomy. The appointment is approved by the Dean of the Graduate School. The Graduate Director(s) will serve as the Chair(s) of the Graduate Program Committee.

The Graduate Program Committee is also responsible for coordinating the admission and advising of graduate students. The Graduate Program Committee can include one student member who will be appointed by the Graduate Program Committee for a renewable one-year term. The student member should be an Anatomy graduate student nominated by his/her/their peers. The student member will be asked to leave the meeting when individual students are being discussed. The student member has no access to the records of other students.

The Graduate Program Committee:

- develops and implements policies and procedures for the operation of the Graduate Program and for associated teaching and research programs of the Graduate Program in Anatomy;
- acts on applications from prospective students;
- provides academic counsel to new students and evaluations of students in the early phases of the Program until each has a permanent Advisor and an individual Advisory Committee;
- plans for future developments in the area of anatomy in the University;

- prepares and submits an annual report of Program activities and accomplishments for the Dean of the Graduate School;
- ensures that regular reviews of the Program, consistent with requirements of the Board of Trustees, are carried out;
- facilitates interaction and communication within the Program of Anatomy and between the Program of Anatomy and interested parties in the University (such as the deans and the heads of related academic units);
- seeks funding in support of the Program; and
- nominates Department of Anatomy Graduate Faculty for Graduate Program Committee membership to ensure continuity over time.

The Director(s) of the Program in Anatomy

(also Chair(s) of the Graduate Program Committee):

- with the assistance of the Graduate Program Committee, administers the Program and the activities of the Graduate Program in Anatomy;
- convenes and chairs meetings of the Graduate Program Committee and the Graduate Program in Anatomy;
- acts on behalf of the Graduate Committee to implement the Program (e.g., to sign requests to schedule examinations, to approve recommendations for appointments to examination committees, new courses, course changes, etc.);
- serves as the link between the Department of Anatomy and the Graduate School; and
- serves as representative of the Program and the Graduate Program Committee to the University Administration, granting agencies, prospective students, etc.

Current Administration: (as of August 2020)

- *Chair(s):*
 - Sulman Rahmat, Ph.D., Associate Professor
 - Janine Ziermann, Ph.D., Assistant Professor
- *Graduate Committee:*
 - Irina Koretsky, Ph.D., Associate Professor
 - Vance Powell, Ph.D., Instructor
 - Fidelis Atianjoh, Ph.D., Associate Professor
 - TBA, student in the Graduate Program in Anatomy

Faculty of the Graduate Program in Anatomy

The faculty of the Graduate Program include all faculty members of the Department of Anatomy who are Graduate Faculty of the Howard University Graduate School. Faculty are appointed as Graduate Faculty by the Graduate School based upon review of candidacy and with respect to criteria set forth by the Graduate School. Faculty of the Graduate Program in Anatomy serve as advisor to a graduate student conducting thesis or dissertation research in anatomy; are active in research in anatomy (as evidenced by current record of research support, publication of recent, refereed papers based upon that research, recent service as an M.S. thesis advisor and/or Ph.D. dissertation advisor, etc.); and who actively participate in the Graduate Program and Program activities.

Comprehensive Faculty List – Graduate Program (August 2020)

Faculty Member	Title	Research Interest
Atianjoh, Fidelis, Ph.D.	Instructor	Basic and Clinical Neuroscience
Bernor, Raymond, Ph.D.	Professor	Human Origins Research, Evolutionary Biology

Csoka, Antonei, Ph.D.	Associate Professor	Stem Cells, Aging, and Epigenetics
Diogo, Rui, Ph.D.	Associate Professor	Comparative Anatomy, Phylogeny, Development, Evolution
Gondre-Lewis, Marjorie, Ph.D.	Professor	Neurodevelopment & Neuropsychopharmacology
Heinbockel, Thomas, Ph.D.	Professor & I-Chair	Neuroscience, Translational Medicine, Drug Discovery
Koretsky, Irina, Ph.D.	Associate Professor	Paleobiology, Biology of Marine Mammals
Liu, Shaolin, Ph.D.	Assistant Professor	Neurobiology of Sensory Systems in Health and Disease
Meshida, Keiko, Ph.D.	Instructor	Comparative & Functional Anatomy
Powell, Vance, Ph.D.	Instructor	Functional Morphology, Biomechanics, Hominid Paleobiology
Rahmat, Sulman, Ph.D.	Associate Professor	Neuroanatomy, Evolutionary Biology, Functional Morphology
Ziermann, Janine, Ph.D.	Assistant Professor	Evolutionary Developmental Biology

General Program Requirements

Supervision

A subcommittee of the Graduate Program Committee, the three-member Graduate Student Advisory & Progress Committee (GSAPC, Chair and two additional members of the Graduate Program Committee), advises each student in the preparation of her/his/their first-year program of study. The committee may require that remedial course work be completed. Depending upon the student's interests, the Committee may also assign the student to an interim faculty advisor selected from the Principal Faculty.

Advisor and Advisory Committee

At the end of Year 1 (mid-May) the student should select an area of study concentration and choose a faculty member to be the permanent Advisor in whose laboratory the thesis/dissertation research will take place. After the student has obtained the concurrence of that faculty member, the student will communicate this decision in writing to the GSAPC. The GSAPC consults with the student and the proposed advisor and then presents the proposal to the Graduate Program Committee. The selection of a dissertation advisor may be delayed, in unusual circumstances, with permission from Graduate Program Committee.

The Major Advisor's responsibilities include:

- to supervise the student's thesis/dissertation research; and
- to advise the student on the selection of a Thesis/Dissertation Committee, on the preparation of the Plan of Study, on the preparation of a dissertation proposal, and on research toward and preparation of a thesis/dissertation.

The student in consultation with his/her/their Advisor will select an Advisory Committee subject to approval by the Graduate Program Committee. For **M.S. students** the Advisory Committee will comprise the Major Advisor and at least two additional faculty members (total of 3). For **Ph.D. students** the Advisory Committee should consist of the Major Advisor and at least four additional faculty members, including at least two members of the Principal (Graduate) Faculty of the Program (one of whom is the major advisor), and a faculty member from outside the university (total of 5).

One of the Program in Anatomy faculty members on the Dissertation Committee other than the major advisor will serve as the chair and will preside over all examinations and other deliberations of the committee. The chair will also provide a summary report of all meetings to the Graduate Program Director. The student proposes the composition of the Dissertation Committee in writing to the Graduate Program Committee for approval. The Advisory Committee proposal must be submitted no later than three months after selection of a Major Advisor.

After the student has a Thesis or Dissertation Advisor (the Major Advisor), advising and research supervision are provided by the student's Major Advisor and individual Thesis or Dissertation Committee. They make every effort to tailor the student's course work to her/his/their individual needs. The Advisory Committee is the formal supervisory body that oversees the progress of the dissertation. It has the responsibility to act as a resource for the

student and mentor, to provide recommendations and advice, and to administer the Final Examination (see below).

The responsibilities of the Advisory Committee include:

- to advise the student on course work and research and to conduct annual advisory meetings,
- to conduct the comprehensive examinations, and
- to accept the thesis/dissertation and to conduct the final examination (thesis/dissertation defense).

Having chosen a major advisor, students will begin a research project. Prior to Advancing to Candidacy (see below) credit for this research may be obtained by enrolling in "Research," ANAT 189-01. Students can enroll in "Research" credits only with permission of a faculty who will oversee the research project.

Vacation Policy

Graduate students are at the same time University employees and research trainees, which complicates the interpretation of holidays. Depending on the level of financial support, graduate students are trainees embarking on a research career and should plan to take advantage of the semester breaks and the summer to work in the laboratory or library (ca. 40 hours/week). They will experience that these class breaks allow long periods of uninterrupted work that are essential for the completion of a successful research or writing project. First year students should consult with the Graduate Program Committee, or with more advanced students for guidelines on how much vacation is considered appropriate. Once students are in the laboratory of their Major Advisor, they should negotiate when to take vacations and how long they will be gone from the laboratory. Students are required to notify the Director(s) of the Graduate Program or their Major Advisor when they make vacation plans. Attendance at scientific meetings or specialized courses is not considered vacation.

Research Rotations

In order to select a rotation laboratory and a thesis/dissertation research advisor, the student should become familiar with the research interests of the Program's Principal Faculty. This is accomplished in two steps: (a) Soon after arrival, first-year students should examine and become familiar with files of recent research papers by the Program's Principal Faculty that will be maintained in the conference room of the Department of Anatomy and can also be accessed on the departmental website maintained by the College of Medicine / Graduate School. (b) During the fall semester of study (Year 1 fall semester) students will take for credit the course "Introduction to Anatomical Research I", ANAT 197-01. During each week of the fall semester, individual faculty in the Department of Anatomy will discuss their research activities with first-year graduate students. Faculty can assign readings from their own research to facilitate this discussion. Each student should meet individually with several members of the Principal Faculty of the Program during the course of the semester in order to discuss research opportunities with those faculty. One suggestion is to arrange to spend several days in the laboratory of individual faculty. Students can sign up for 1 hour of Research Credit for these visits and will write a report about their visit to each laboratory ("Research," ANAT 189-01).

In addition, each student must take at least two research rotations in the first year in the Program. The course "Research," ANAT 189-01, provides a formal mechanism for these rotations, the purpose of which is to encourage the student to have "hands-on" experience in one or two areas of interest to her/him, to learn selected research methods in the field, and to become acquainted with the laboratory work and research group of one or two prospective thesis/dissertation advisors. Faculty members will expect a serious and conscientious effort on the part of rotation students, but successful rotations will not necessarily lead to the completion of a specific project and/or publication.

Likewise, all faculty members in the Department of Anatomy are expected to afford graduate students with the opportunity for a rotation in their laboratory. Students are discouraged from doing formal laboratory rotations

during the Year1 Fall semester, because of the heavy course load. However, students are strongly encouraged to visit the laboratories of Program faculty during this semester.

Lab rotations will typically last between 8 and 16 weeks with students spending 10-20 hours/week in the lab. The durations of the rotations and the expectations of both the student and the faculty member must be discussed in advance. To receive credit for "Research" ANAT 189-01, the student must submit a one-page outline of the proposed rotation in advance to the GSAPC through the Director of the Graduate Program. This outline must specify the length and hours per week of the rotation, along with a description of the work to be performed. The outline must be signed by both the student and the faculty member. Upon completion of the rotation, the student must submit a brief, one-page summary that describes the work performed and the techniques learned. A grade will not be issued until the report is turned in.

Students may receive credit for "Research" ANAT 189-01 during both the fall (lab visits) and spring semesters (lab rotations) of their first year. Both students and faculty are advised to contact the Director of the Graduate Program midway through the rotation to provide a status report. As the rotation is completed an evaluation form is submitted to the Graduate Program Committee by both the student and the faculty member. The rotation focus or duration in a given laboratory can be altered at any time through mutual consent of the student and faculty member. All changes must be communicated in writing to the Director of the Graduate Program.

First-Year Evaluations

At the end of each semester of the first year in the program each student undergoes an evaluation by the GSAPC. These evaluations review the student's research and course performance and input from the student's rotation advisor(s). Progress in the selection of a thesis/dissertation advisor is a critical component. The result of the evaluation will be reported to the Graduate Program Committee. If the student fails to make satisfactory progress, the Graduate Program Committee will recommend guidelines for improvement or dismissal from the Program.

Teaching

Teaching is an important element in academic careers in Anatomy. Therefore, supervised experience in university-level teaching is considered essential in our graduate program. **Each student is required to serve as a Teaching Assistant**, in courses approved by the Graduate Program Committee, for at least two semesters out of the first four. In addition, the student may be required by her/his/their Advisory Committee and the Graduate Program Committee to assume certain other limited teaching responsibilities that are deemed to be an integral and essential part of her/his/their predoctoral education. Student performance of teaching duties will be evaluated by the faculty members responsible for the course(s) in which the student participates. **The student's teaching performance must be rated as satisfactory in order to fulfill this teaching requirement.**

Annual Advisory Meetings for Advanced Students

It is the graduate student's responsibility to arrange a meeting with her/his/their Advisory Committee during the fall semester of the second and subsequent years in the Program. Prior to that meeting, the student submits to the Advisory Committee and the Graduate Program Committee a written report (ca. 3-5 typed pages) on her/his/their progress toward completion of course work and thesis research over the preceding year. At the meeting, the student presents a carefully prepared and illustrated oral version of the report (ca. 30 min) outlining research progress over the prior year and submits to questioning about that work. The Advisory Committee then discusses the student's progress with the Major Advisor (in the absence of the student) and with the student (in the absence of the Major Advisor). A brief report of each such meeting is to be submitted to the Graduate Program Committee by the chairperson of the student's Advisory Committee.

Seminars and Journal Clubs

The Department of Anatomy and the Graduate Program in Anatomy organize journal clubs, discussion groups, and sponsors seminars and colloquia. Each student is required to participate, actively and throughout the period of

predoctoral study, in one or more of these journal clubs and discussion groups and to regularly attend these public seminars and colloquia. Students have the opportunity to receive credit for attendance of the departmental seminar series by providing written summaries of the research presentations (“Topics in Anatomical Research”, ANAT 208-01). Advanced (3rd year and beyond) students must present their research progress in one of these settings at least once a year. It is the student's responsibility to notify the Graduate Program Committee and the members of the Advisory Committee of the presentation. These presentations will be publicly announced to the College of Medicine community. The student's attendance and performance in these forums will be evaluated by her/his/their Major Advisor and Advisory Committee.

The Graduate Program in Anatomy mandates several activities deemed critical to our student's professional development, including, but not limited to, participation in journal clubs, seminars, and professional development courses. Students are expected to attend all activities designated by the Graduate Program Committee as mandatory. Students who are unable to attend a particular activity are required to receive prior approval from the Graduate Program Director. **Failure to attend three mandatory activities in a given semester will be considered as a failure to meet academic standards and will result in a recommendation to the Graduate School to place the student on academic probation. Students who do not satisfy the probationary terms dictated by the Graduate School may be dismissed from the Program.**

Graduate Expository Writing

Students must pass either the English Proficiency Examination or the course in Expository Writing.

Responsible Conduct of Research

Students must attend and pass the Howard University Graduate School **Responsible Conduct of Research** Workshop. Students are held to professional and ethical standards set forth by Howard University.

Specific Requirements for the Master of Science Program in Anatomy

Residence

The student must spend at least two semesters as a graduate student at Howard University and must be enrolled in the Graduate School during the semester in which the degree is conferred. The degree must be obtained within five years of starting the program.

Credits

A minimum of thirty-two (32) credit hours is required for the M.S. degree. No more than six semester hours of work may be in courses yielding thesis credit. A course load of 12 credits is normal for full-time students, but course loads of 9 to 15 credits are considered full-time by the Graduate School. As long as a student is using the University's facilities or is conferring in person with his/her/their thesis advisor, he/she must continue to enroll in a thesis course even if other course requirements are completed. Such a student shall register as an auditor if he/she has already accumulated the maximum number of hours permitted for thesis courses.

The Graduate School mandates that students are expected to complete a Master degree within a maximum of five years from the date of initial registration in the program. Credit for courses pursued more than five and less than seven years prior to the term in which the student presents herself/himself for the final oral examination, may be restored and counted for the fulfillment of degree requirements. The Graduate Program Committee has the option to make a recommendation to the Dean of the Graduate School for course restoration. Students may not receive credit toward the degree for a course, which the student pursued more than seven years prior to the time the student presents herself/himself for the final oral examination.

Core Courses

All students **must** take the following courses:

Subject Code & Course Number	Course Title	Credit Hours
ANAT 301	Musculoskeletal Anatomy	6
ANAT 173	Neurobiology	6
ANAT 197	Introduction to Anatomical Research I	2
ANAT 198	Introduction to Anatomical Research II	2
ANAT 202	Histology and Cell Biology	5
ANAT 208	Topics in Anatomical Research	1
ANAT 213	Organ Systems Anatomy	4
ANAT 189	Research	2 (Lab rotation)
ANAT 200	Thesis Writing	1 (do not take without approval of Graduate Directors)
Electives must include courses in Physiology and/or Biochemistry/Molecular Biology (6 credits)		
Statistics: BIOL 430 or equal (4 credits)		

Additional course requirements will be determined by the student's Advisor and Advisory Committee. The student must consult with his/her/their Advisor and Advisory Committee to determine if a course that is not listed is acceptable. It is mandatory that all M.S. students in the Anatomy Program will have hands-on research experience, and this will be obtained under direction of their Advisor. As a minimum, the student should spend one summer working in the research laboratory of his/her/their advisor (or another faculty member designated by the advisor).

A grade of A or B must be earned in each core course. Any student who receives a C in a core course must retake that course and receive an A or B.

Grades

A grade average of 3.0 (B) is required for graduation. If a student's grade average drops below 3.0, he/she must raise that average within two semesters or be dropped from the University. Any student who receives more than 9 credits below B will be dropped from the Graduate School.

Admission to Candidacy

The student will be admitted to candidacy for the Master of Science degree after:

1. Satisfactorily completing coursework required by the Advisory Committee
2. Satisfying the departmental teaching requirement
3. Obtaining approval by the Advisory Committee of a problem to investigate
4. Satisfying the expository writing requirement and fulfilling any language requirement
5. Receiving the recommendation of the Graduate Program in Anatomy
6. Securing approval of the Graduate School
7. Secure the approval of the Howard University Institutional Review Board (HUIRB), the Howard University Institutional Animal Care and Use Committee (IACUC) or other institutional committees as required for the research project. **This should be accomplished at the end of the second year of study.**

Admission to candidacy must be achieved no later than six weeks before the end of the semester in which the student expects to receive the master's degree.

Master Thesis

The Master Thesis will be based on laboratory or field research conducted during the course of study. The thesis cannot be primarily based on literature research. A completed research project is expected for the thesis. The thesis is structured as follows:

Abstract

Introduction

This section should include a statement of the problem, its background and significance, the general approach and the significance of the research. It should give a critical review of the literature and give a historical framework for the problem.

Methods

In this section, procedures and methodology to be used should be described. A justification of the chosen protocol should be included.

Results

The data obtained based on the candidate's research should be presented in figures and tables. The results should also be described in the text.

Discussion

The results should be discussed with respect to their effect on the resolution of the problem studied. The student should also include a section on the significance of the results and propose future studies in the field.

Bibliography

The references should be in a consistent style in accordance with the requirements of the Graduate School.

Final Examination

Formal defense of the master's thesis constitutes the final examination.

The defense comprises two parts:

- a one-hour public colloquium in which the candidate presents her/his research and explains how it contributes to the advancement of understanding of the field of anatomy, and
- an oral examination by the candidate's Advisory Committee and other qualified persons acceptable to the committee. There is no minimum time limit for the final examination, but the examination may not exceed three hours.

The Final Examination will be chaired by a member of the Advisory Committee other than the Major Advisor. After successful completion of the final examination, the candidate must submit a final copy of the master's thesis to the Graduate Program Committee for a format review. The candidate makes any corrections required and provides signed copies of the final thesis to his/her/their Advisory Committee. The candidate also provides a final copy of the thesis to the Graduate Program Director to be bound for the Program's library.

Outline of a Typical Program

During the first year of study, students focus on the fundamental principles of anatomy while exploring research options. The core curriculum includes in depth study of:

Year One, Fall Semester (14 credits)

- ANAT 301: Musculoskeletal Anatomy (6 credits)
- ANAT 202: Histology and Cell Biology (5 credits)
- ANAT 208: Topics in Anatomical Research (1 credit)
- ANAT 197: Introduction to Anatomical Research (2 credits)

Year One, Spring Semester (13-15 credits)

- ANAT 173: Neurobiology (6 credits)
- ANAT 213: Organ Systems Anatomy (4 credits)

- ANAT 198: Introduction to Anatomical Research (2 credits)
- ANAT 198: Research – Lab Rotation (1-3)

Year One, Summer

- ANAT 198: Research – Lab Rotation (1-12 credits)
- Work in research lab with Advisor
- Choose problem to study and begin research

Year Two, Fall Semester (12-15 credits)

- ANAT 198: Research – Lab Rotation (1-12 credits)
- Electives (3-6 credits) must include courses in Physiology and/or Biochemistry/Molecular Biology
- Statistics (4 credits)
- Obtain approval of research problem from Advisory Committee
- Continue research and begin writing Thesis proposal
- Teach in undergraduate lab course

Year Two, Spring Semester (12 credits)

- ANAT 198: Research – Lab Rotation (1-12 credits)
- Electives (2-x credits)
- Teach in undergraduate lab course
- Advance to candidacy
- Finish writing Thesis and present to Advisory Committee
- Defend Thesis in Final Exam

Specific Requirements for the Ph.D. Program in Anatomy

Residence

At least four semesters of full-time study shall be in the Graduate School of Howard University. Two of these four semesters of full-time study shall be consecutive. A candidate for a degree must be enrolled in the Graduate School during the semester in which the degree is conferred.

Credits

A student with no previous graduate work is subject to the academic requirements of the Master of Science Program until 34 graduate credits have been earned. A course load of 12 credits is normal for full-time students, but course loads of 9 to 15 credits are considered full-time by the Graduate School. A minimum of 72 graduate credits (34 graduate credits of coursework) and a minimum of six semesters of study beyond the Bachelor of Science degree are required. A minimum of 12 credits of work toward the degree must be earned after admission to candidacy. All courses required for the Ph.D. degree should be taken at Howard University unless approved by the Graduate Program Committee and the Graduate School.

The Graduate School mandates that students are expected to complete a Ph.D. degree within a maximum of seven years from the date of initial registration in the program. Credit for courses pursued more than seven and less than ten years prior to the term in which the student presents herself/himself/themselves for the final oral examination, may be restored and counted for the fulfillment of degree requirements. The Graduate Program Committee has the option to make a recommendation to the Dean of the Graduate School for course restoration.

Students may not receive credit toward the degree for a course, which the student pursued more than ten years prior to the time the student presents herself/himself for the final oral examination.

Core Courses

All students **must** take the following courses:

Subject Code & Course Number	Course Title	Credit Hours
ANAT 301	Musculoskeletal Anatomy	6
ANAT 173	Neurobiology	6
ANAT 197	Introduction to Anatomical Research I	2
ANAT 198	Introduction to Anatomical Research II	2
ANAT 202	Histology and Cell Biology	5
ANAT 208	Topics in Anatomical Research	1
ANAT 213	Organ Systems Anatomy	4
ANAT 189	Research	2 (Lab rotation)
ANAT 200	Thesis Writing	1 (do not take without approval of Graduate Directors)
Electives must include courses in Physiology and/or Biochemistry/Molecular Biology (6 credits)		
Statistics: BIOL 430 or equal (4 credits)		

Additional course requirements will be determined by the student's Advisor and Advisory Committee. The student must consult with his/her/their Advisor and Advisory Committee to determine if a course that is not listed is acceptable. It is mandatory that all M.S. students in the Anatomy Program will have hands-on research experience, and this will be obtained under direction of their Advisor. As a minimum, the student should spend one summer working in the research laboratory of his/her/their advisor (or another faculty member designated by the advisor).

A grade of A or B must be earned in each core course. Any student who receives a C in a core course must retake that course and receive an A or B.

Electives in Another Field

At least 6 units of classes, have to be taken in a field other than anatomy. Students can pursue electives in another established department or program tailored to the student's interests. Examples of some elective programs include Biochemistry, Biology, Genetics, Microbiology, Pharmacology, Physiology and Biophysics, Psychology, and others. The electives must be selected in consultation with and approved by the Advisor, Advisory Committee, and/or the Graduate Program Committee.

Rate and Quality of Work

Ordinarily, students should complete all requirements for the Ph.D. degree within 4-5 years. Every student must take at least 12 units of graduate course work in each fall and spring semester until advancing to candidacy in order to remain in good standing in the Program. A checklist of requirements (see Outline of a Typical Program) is maintained by the Director of the Graduate Program and reviewed annually for each student by the GSAPC and by the Graduate Program Committee. If a student falls one semester behind the timeline laid out in the checklist, he or she will meet with the GSAPC, which will make recommendations to help resolve any problems. If a student falls one year behind their commended timeline, in the absence of extenuating circumstances, he/she/they may be referred to the Graduate School for conversion to non-degree status.

Students will be notified by June 1st of each year of their satisfactory or unsatisfactory progress. Only courses earned with a grade of A or B may be counted toward the Doctor of Philosophy degree. A grade average of 3.0 (B) is required for graduation. If a student's grade average drops below 3.0, he/she must raise that average within two semesters or be dropped from the Graduate School. After a student has earned 34 graduate credits, only two grades of C are allowed by the Graduate School. Students receiving a third C will be dropped from the Graduate School. In unusual circumstances, a student may apply for and be granted up to a one-year leave of absence. In the

event of unexcused interruption of graduate work for one semester (not including summers), the student must apply to be readmitted to both the Graduate School and the Program.

Qualifying Examination

This will consist of a written examination designed to demonstrate the student's broad understanding of the various disciplines of Anatomy as well as specialized knowledge in the student's field of concentration. The examination will be prepared and administered by the student's Advisor and Advisory Committee, and normally is administered at the end of the second year. Prior to the examination, members of the Advisory Committee will submit a reading list to the student (directed reading). The list will serve to focus on the areas to be covered in the examination, but by no means will restrict the content of the examination. The Advisory Committee will report the student's performance on the Qualifying Examination to the Graduate Program Committee as:

1. Pass with honors
2. Pass
3. Pass with the understanding that the student will expand or strengthen his/her/their knowledge in a specific area (the Advisory Committee and Advisor will direct this additional study).
4. Fail with the option to be re-examined within six months.
5. Fail with the option to complete work for the Master of Science degree.
6. Fail without the option of re-examination. The student must withdraw immediately from the Graduate Program. Any student who fails the examination for a second time will **not** be allowed to continue work toward the Ph.D. degree.

Summary of responsibilities for qualifying examination:

Student:

- Hold advisory committee meeting (at least 3-4 months prior to intended examination date)
- Meet individually with committee members (at least 2 months prior to examination)

Advisory Committee chair:

- Organize assignment of question-writing responsibilities among committee members, with the questions in each area of the examination written by one or two committee members (at least 3-4 months prior to intended examination date)
- Compile and uniformly format written questions, and in conjunction with individual committee members,
- Revise or replace questions as needed to achieve breadth, depth, and clarity in each area of the examination
- Distribute complete examination to all committee members for review and approval
- Submit examination to Graduate Program Committee for review (at least 2 months prior to examination date), and make changes as suggested by the Graduate Program Committee (at least one month prior to examination). Send complete revised examination to all committee members
- Arrange with student details of time, place, location, computer use, etc., for examination
- Collect written answers from student, and distribute to appropriate committee members for evaluation (immediately following examination)
- Collect evaluations from committee members, calculate "GPA," and inform student of outcome (within 3 days after examination)
- If necessary, organize committee meeting to consider possible repeat examination (within one week after examination)

Advisory Committee member:

- Write clear, concise questions that individually test the student's understanding of individual topics; each member writes a set of three to five questions to cover the breadth of one of the chosen areas of anatomy; the total set of questions from all members covers the entire area of anatomy.
- Provide questions to Advisory Committee chair approximately 3 months prior to examination, and work with committee chair, as necessary, to revise exam for overall breadth and depth
- Meet with student to guide student's preparation for examination
- Evaluate student's examination answers within 3 days after examination, and communicate results to committee chair
- Within one week after examination, if necessary, consider whether a repeat examination will be allowed

Dissertation Proposal

Having passed the qualifying examination, the student is required to submit a dissertation-research proposal using the forms and format of NIH or NSF grant applications, exclusive of the budget section. The proposal will be based upon, and must present a summary of, comprehensive work carried out by the student in the laboratory and under the advice of her/his/their Advisor, and this document should present a carefully prepared, thoughtful, critical, and realistic plan of research actually intended to lead to the completion of the dissertation. This proposal should ordinarily be submitted to the student's Dissertation Committee (with a copy to the Graduate Program Committee) at the beginning of the student's third year in the Program. After all members of the Dissertation Committee have found the proposal to be satisfactory with respect to its content and quality of presentation, the student must arrange a meeting of the Committee for an oral defense of, as well as critical advisory input about, the research plan.

The dissertation proposal must be presented as a departmental seminar followed by a closed session with the student and his/her/their Advisory Committee. The chairperson of the Advisory Committee will submit to the Graduate Program Committee a written report of the Dissertation Committee's evaluation of the proposal and its defense. The dissertation proposal should adhere to the format outlined below:

Abstract

Specific Aims

This section should include a statement of the problem and state the aims of the studies.

Background and Significance

This section will provide background and significance of the project.

Preliminary Studies

Data obtained by the student and pertinent to the proposal will be explained and illustrated in this section.

Research Design and Methods

The rationale and justification of the aims, experimental plan, anticipated outcomes, potential pitfalls and alternatives will be presented in detail in this section. The methods used in the study will be included in a separate section.

Biobibliography

The references should be in a consistent style in accordance with the requirements of the Graduate School.

Admission to Candidacy

A student will be admitted to candidacy for the Ph.D. degree after:

1. Satisfactorily completing course work required by the Advisory Committee
2. Passing the qualifying examination

3. Obtaining approval of the dissertation proposal
4. Obtaining certification of competency in English
5. Fulfilling any language requirement
6. Receiving the recommendation of the Graduate Program
7. Securing the approval of the Graduate School
8. Secure the approval of the Howard University Institutional Review Board (HUIRB), the Howard University Institutional Animal Care and Use Committee (IACUC) or other institutional committees as required for the research project.

The candidate for admission shall make formal application to the Director of the Graduate Program and the Dean of the Graduate School, who shall present the student's record to the Graduate School for approval. Candidacy for the Ph.D. degree shall be valid for not more than five calendar years. Any student whose candidacy has expired may make application to the Graduate School for readmission. **The Graduate School requires students to earn at least 12 credits after admission to candidacy.**

Dissertation

The candidate is required to present a dissertation based upon original investigation which shows significant research in his/her/their major field. The dissertation should demonstrate the candidate's familiarity with the methods of research and the candidate's ability to organize and present effectively the results of his/her/their research. To be acceptable, this dissertation should be a worthwhile and novel contribution to knowledge in the student's field of concentration. The dissertation must conform to the Graduate School Rules and Regulations Book.

The student's Advisor and his/her/their Advisory Committee will be responsible for guiding the student in the research project and in the writing of the dissertation. They will also arrange for the defense of the dissertation. It is the student's responsibility to arrange meetings with the Advisor and the Advisory Committee at 6-month intervals to discuss and evaluate the student's research progress. It is recommended that the first draft of the dissertation be deposited with the Advisory Committee no later than six months before the date of the final examination for the degree. Communication between the student and his/her/their Advisory Committee is essential and is to be facilitated by the student's advisor.

Prior to the final exam, the student must present his/her/their research findings in a departmental seminar.

Final Examination

The candidate shall be required to pass a final oral examination. The examination shall be based primarily upon the student's research and related areas of study. Formal defense of the dissertation constitutes the final examination. The examiners are appointed by the Dean of the Graduate School upon recommendation of the Graduate Program in Anatomy and shall consist of a minimum of five persons, at least one of whom shall be from outside the university. The internal members must be members of the Graduate Faculty. The student's Advisory Committee will be recommended to act in this capacity where possible, and the outside examiner(s) will be selected by the student's faculty advisor. The Final Examination will be chaired by a member of the Advisory Committee other than the Major Advisor. The final examination shall be open to all members of the faculty of the university and to other persons who may be invited by the candidate's Advisory Committee. The defense comprises two parts:

- a one-hour public colloquium in which the candidate presents her/his research and explains how it contributes to the advancement of understanding of the anatomy, and
- an oral examination by the candidate's Advisory Committee and other qualified persons acceptable to the committee. There is no minimum time limit for the final examination, but the examination may not exceed three hours.

After successful completion of the final examination, the candidate must submit a final copy of the dissertation thesis to the Graduate Program Committee for a format review. The candidate makes any corrections required and provides signed copies of the final thesis to his/her/their Advisory Committee. The candidate also provides a final copy of the thesis to the Graduate Program Director to be bound for the Program's library.

Outline of a Typical Program

During the first year of study, students focus on the fundamental principles of anatomy. First-year students explore research interests and become acquainted with prospective dissertation advisors by working with at least two faculty members on short laboratory projects. These projects allow students the opportunity to explore research techniques and discover new areas of interest. During the first year, students are advised by the Graduate Student Advisory and Progress Committee. At the end of the first year, students are expected to select a Major Advisor, who from that point onward provides mentoring and support.

The core curriculum includes in-depth study of:

Year One, Fall Semester (14 credits)

- ANAT 301: Musculoskeletal Anatomy (6 credits)
- ANAT 202: Histology and Cell Biology (5 credits)
- ANAT 208: Topics in Anatomical Research (1 credit)
- ANAT 197: Introduction to Anatomical Research (2 credits)

Year One, Spring Semester (13-15 credits)

- ANAT 173: Neurobiology (6 credits)
- ANAT 213: Organ Systems Anatomy (4 credits)
- ANAT 198: Introduction to Anatomical Research (2 credits)
- ANAT 198: Research – Lab Rotation (1-3)

Year One, Summer

- ANAT 198: Research – Lab Rotation (1-12 credits)
- Work in research lab with Advisor
- Choose problem to study and begin research

Second-year students continue coursework to complete requirements for anatomy and electives, while reviewing a broad spectrum of topics in preparation for the comprehensive examinations. Under the direction of the Major Advisor, second-year students begin the research that will be the foundation of their dissertation. With the help of the Major Advisor, second-year students select a Dissertation Committee. Upon completion of coursework, and before advancing to Ph.D. candidacy, students must complete both written and oral comprehensive examinations. The written and oral examinations explore the student's comprehensive knowledge of anatomy.

Year Two, Fall Semester (12-15 credits)

- ANAT 198: Research – Lab Rotation (1-12 credits)
- Electives (3-6 credits) must include courses in Physiology and/or Biochemistry/Molecular Biology
- Statistics (4 credits)
- Obtain approval of research problem from Advisory Committee
- Continue research and begin writing Dissertation proposal
- Teach in undergraduate lab course

Year Two, Spring Semester (12 credits)

- ANAT 198: Research – Lab Rotation (1-12 credits)

- Electives (2-x credits)
- Teach in undergraduate lab course
- Advance to candidacy
- Finish writing Thesis and present to Advisory Committee
- Defend Thesis in Final Exam

In the **third and subsequent years** of their program, students focus on the research that will lead to the dissertation. Advanced students are expected to present the results and progress of their research efforts at a seminar or journal club at least once a year. Students learn how to prepare scientific talks and papers. Their skills improve markedly as students receive feedback from both faculty and fellow students on written and oral presentations.

Year Three, Fall Semester (12 credits)

- ANAT 198: Research – Lab Rotation (1-12 credits)
- Electives if needed (3-6 credits)

Year Three, Spring Semester (12 credits)

- ANAT 198: Research – Lab Rotation (1-12 credits)
- Electives if needed (2-x credits)

Year Four (and Five), Fall / Spring Semester (12 credits)

- ANAT 198: Research – Lab Rotation (1-12 credits)
- Advance to Candidacy
- Finish writing Dissertation and present to Advisory Committee
- Defend Dissertation in Final Exam
- The oral defense examination consists of a public presentation of dissertation research and an oral defense of the dissertation before the Advisory Committee.