BIOMEDICAL SCIENCES (PHD)

Vilcek Institute of Graduate Biomedical Sciences (https://med.nyu.edu/research/vilcek-institute-graduate-biomedical-sciences/)

NYSED: 44091 **HEGIS:** 0499.00 **CIP:** 26.0102

Program Description

At the Vilcek Institute of Graduate Biomedical Sciences at NYU Langone Health, aspiring scientists in our PhD degree program conduct their thesis research in the laboratories of nationally and internationally recognized faculty members. By providing high-quality academics and research, and by championing diversity and inclusion (https://med.nyu.edu/research/office-science-research/diversity-equity-inclusion/), we train future scientists and critical thinkers in an environment supportive of scientific discovery and professional growth. This allows our students to become top achievers in scientific research and also to hone skills spanning any career.

Admissions

All applicants to the Graduate School of Arts and Science (GSAS) are required to submit the general application requirements (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc.html), which include:

- Academic Transcripts (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc/academic-transcripts.html)
- Test Scores (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc/test-scores.html) (if required)
- Applicant Statements (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc/statements.html)
- Résumé or Curriculum Vitae
- Letters of Recommendation (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc/letters-of-recommendation.html), and
- A non-refundable application fee (https://gsas.nyu.edu/admissions/arc.html#fee).

See PhD Program Admissions (https://med.nyu.edu/research/vilcek-institute-graduate-biomedical-sciences/phd-program/phd-program-admissions/) for admission requirements and instructions specific to this program.

Program Requirements

Course	Title	Credits
Required Courses		
BMSC-GA 4532	A PhD Experience (APEX)	1.5
BMSC-GA 4537	Systems Biomedicine and Society: Genetics	1.5
BMSC-GA 4451	Data Analysis and Biostatistics with R	4
BMSC-GA 4540	Foundations of Science Communication I	2
BMSC-GA 1997	Foundations of Science Communication II	2
BMSC-GA 2000	Scientific Integrity & the Responsible Conduct Rearch	1
Electives		
Other Elective Credits		60
Total Credits		**72**

Additional Program Requirements

Research Rotation

First-year students will conduct two to three research rotations in the spring semester lasting about 8 weeks each to gain experience working in labs of their interest. The goal of these rotations is to help students choose a thesis lab at the end of the first year providing time for both the student and the faculty to evaluate the potential working relationship. PhD students spend four or more years conducting dissertation research in a laboratory beginning in year 2. It is critical to identify a thesis advisor they can work with for their entire training. Spending about 8 weeks in two to three labs in the first year gives enough time and experience to determine if the advisor and their lab are the best fit for the student. After completing these rotations and by the end of the first year, the student will select their research lab and thesis advisor, who is the principal investigator (PI) of that lab. Prompt placement of the student in a lab is critical to the student's ability to move on a timely path toward graduation.

Thesis Research

Students are expected to identify a laboratory to conduct their thesis research following the Spring semester of year 1 and after completion of rotations. As a member of the laboratory, the student is expected to lead an independent research project under the guidance of their thesis advisor, who will be responsible for evaluating student progress towards a degree together with the thesis committee (described below). To complete their dissertation research, students are expected to lead or co-lead a significant scientific effort to be published in a peer-reviewed journal. Students enroll for approximately 7 research credits per semester starting in their second year. Full-time status is maintained by near full-time work in the laboratory, which is estimated to equal at least 30 hrs per week in addition to their other curricular requirements.

Works in Progress Seminar (WIP)

All students are required to participate in a WIP seminar each semester starting in year 2. Students will be permitted to select a seminar that best aligns with their thesis research and career goals, can engage in multiple seminars, and can switch as their training needs evolve. The purpose of the WIP requirement is to engage a relevant scientific community to receive continued education in the discipline and peer feedback and to enable opportunities for formal presentation to a scientific audience. Students will be evaluated on their attendance and active participation, which includes the presentation of their dissertation research. Faculty facilitators will provide feedback on presentation effectiveness and style. Active participation in a Works in Progress seminar is expected until permission to defend is granted. To support the trans- and inter-disciplinary training of our students, to encourage competency in communicating science to diverse audiences, and increase exposure to diverse disciplines Vilcek will administer four integrated WIP seminars that will be held simultaneously in parallel rooms with a common coffee hour to promote interaction across disciplines:

1. Cellular and Molecular Mechanisms
2. Systems Physiology in Health and Disease
3. Technology in Biomedicine
4. Population and Data Science

Qualifying Exam

The qualifying examination is administered after the second term (Spring, 1st year) of full-time study. The examination occur in two parts: a written exam and oral defense. Both components are designed to test the

student's field of concentration and related subjects with important emphasis on the demonstration of critical thinking skills and ability to integrate discipline-specific knowledge to dissect complex questions in their field. The examination is conducted by a committee of 3-5 faculty members within the student's discipline who evaluate the breadth of knowledge in the discipline, depth of familiarity with topic-specific literature, critical thinking, and ability to articulate and defend scientific logic. Students will receive a "Pass", "Fail", or "Conditional" decision made immediately by the committee at the end of the oral exam and reported to the student, together with the committee consensus on detailed evaluation points. A decision of "Conditional" will include a description of what areas are lacking, what needs to be repeated, whether the repeat can be done in written or oral format, and the specific criteria that will be used to achieve successful completion of the exam. In consultation with the student, a timeline for the completion and re-take will be set as well. However, in no case will this exceed 8 weeks. Students who outright fail both the written and oral parts of the exam will be terminated from the program. Upon successful completion of the qualifying exam and acquisition of 72 credits, students advance to PhD candidacy and earn a Master of Philosophy.

Thesis Committee

In consultation with their thesis advisors, students will select a thesis committee consisting of a minimum of three NYU faculty members with complementary expertise. The committee should not be composed of close collaborators of the advisor working on the mentee's project and need not be people with expertise specific to the proposal, but rather faculty capable of objectively evaluating progress and feasibility to reach publication. Each committee will appoint a Chair who will be responsible for reporting progress to Vilcek. The Chair must be an Associate Professor or Professor who has previously graduated students. The committee together with the thesis advisor will be responsible for tracking the student's research progress toward a dissertation. Meetings will be held every 6-9 months at a minimum. Students will provide a written update and
self-assessment to the committee one week before each meeting, and committees will submit a progress report to Vilcek signed by all committee members, the thesis advisor, and the student. At each meeting, both the student and the advisor will have the opportunity for a private meeting with the committee to confidentially address performance or professional issues that might arise. At the first meeting of the thesis committee, to take place after completion of the fourth term, students will present their thesis proposal for feedback on feasibility, rigor, and impact. The proposal will be presented 2 weeks in advance of the in person meeting as a written NRSA style fellowship award, developed in part during the course of the Communicating Science II course required for all students in the fourth term. Students are expected to move efficiently towards completion of their degree according to the requirements outlined herein. It is the responsibility of the committee to raise concerns about student progress or the mentoring relationship with Vilcek leadership as soon as it is evident. This will allow the central leadership to support the student and mediate the situation proactively using the resources described above.

Research Paper

To demonstrate scientific achievement, all students are required to have made a significant contribution to peer-reviewed, published primary literature, including but not limited to a first-author peer- reviewed research paper representing some or all of their dissertation research (published or accepted for publication). In place of a first-author peer-reviewed publication, the thesis committee may deem a body of collaborative and co-authored publications, also accepted and peer-reviewed, to be equivalent and worthy of degree completion. These published works should, however, fit into an overall theme of the thesis and thereby represent a cohesive body of work. These accommodations are in line with the increasingly collaborative nature of biomedical science, and in this model students and faculty will be encouraged to consider collaborative projects in their thesis work. As an applied, research-based degree, the contribution of novel research in the defined area of expertise is a necessary and important degree requirement. Completion of a published work before graduation ensures that students are trained through the whole process from scientific conception through data generation, critical review, and completion, receive full credit for their contribution, and can leverage their thesis work for future professional success.

Dissertation

It is the prerogative of the thesis committee to grant permission to the student to defend their thesis when they have met the curricular and research requirements of the degree (as defined herein). Upon receiving permission from the committee, the student will be required to complete a written dissertation synthesizing their thesis work completed while in the program. The dissertation must include a deep and comprehensive introduction that places the work in the context of the field and a scholarly and independently written discussion that synthesizes the work included. Research chapters may be adapted from student publications. Chapters may also include unpublished work and work in submission. At the beginning of each chapter, the student is expected to cite relevant publications and provide a detailed description of their specific contribution to the project as well as the role of their co-authors. The dissertation is provided to the committee at least four weeks in advance of the scheduled defense and the thesis committee has the right to cancel the oral defense up to two weeks before if the written thesis is found to be not satisfactory.

Oral Defense

When the PhD thesis dissertation is completed and approved by the thesis committee, a formal public seminar is held at which the candidate presents their thesis work. The candidate afterward defends the results of their research in a closed-door session before their faculty thesis committee. The final defense committee must include an outside reader to be selected from outside any branch of NYU and approved by the Vilcek administration before the defense. Outside readers should meet all the requirements of the core Vilcek Training Faculty and hold expertise relevant to the thesis research. The advisor, thesis committee members, and the outside reader are all voting members of the committee to make the final decision on the outcome of the defense.

Sample Plan of Study

Course	Title	Credits
1st Semester/Term		
BMSC-GA 4532	A PhD Experience (APEX)	1.5
BMSC-GA 4537	Systems Biomedicine and Society: Genetics	1.5
BMSC-GA 4451	Data Analysis and Biostatistics with R	4
BMSC-GA 2000	Scientific Integrity & the Responsible Conduct Rearch	1
Elective		4
Elective		4
	Credits	**16**
2nd Semester/Term		
BMSC-GA 4540	Foundations of Science Communication I	2
Lab Rotations		3
Elective		4

Elective		3
	Credits	**12**
3rd Semester/Term		
Works In Progress Seminar		1
PhD Research		11
	Credits	**12**
4th Semester/Term		
BMSC-GA 1997	Foundations of Science Communication II	2
Works In Progress Seminar		1
PhD Research		9
	Credits	**12**
5th Semester/Term		
PhD Research		12
	Credits	**12**
6th Semester/Term		
PhD Research		8
	Credits	**8**
	Total Credits	**72**

Following completion of the required coursework for the PhD, students are expected to maintain active status at New York University by enrolling in a research/writing course or a Maintain Matriculation (MAINT-GA 4747) course. All non-course requirements must be fulfilled prior to degree conferral, although the specific timing of completion may vary from student-to-student.

Learning Outcomes

Upon successful completion of the program, students will:

1. Be provided with depth in defined disciplines through coursework in lab research, and community training.
2. Have established a foundation of competence and rigor in data analysis, visualization, and statistics.
3. Develop and foster foundational skills in the accurate and effective communication of science.
4. Learn to contextualize scientific contribution across biomedical disciplines.

Policies

Graduate School of Arts and Science Policies

Academic Policies for the Graduate School of Arts and Science can be found on the Academic Policies page (https://bulletins.nyu.edu/graduate/arts-science/academic-policies/).

NYU Policies

University-wide policies can be found on the New York University Policy pages (https://bulletins.nyu.edu/nyu/policies/).