CIVIL ENGINEERING (PHD)

Civil and Urban Engineering Department (https://engineering.nyu.edu/academics/departments/civil-and-urban-engineering/)

NYSED: 08810 **HEGIS:** 0908.00 **CIP:** 14.0801

Program Description

Growing and established cities are continually meeting new infrastructure needs and maintaining older systems, such as highways, bridges, and airports. The Tandon School of Engineering's PhD in Civil Engineering program produces graduates dedicated to enriching the field. Research-oriented and focused on the latest developments in the discipline, our program readies students for civil engineering research careers in the private sector. It also prepares students to teach at the university level, ensuring the most recent advancements in the field are shared with a new generation of civil engineers.

Goals and Objectives

The PhD in Civil Engineering is research-oriented and intended for those whose goal is a career in civil engineering research and/or teaching at the university level or in private research organizations. Specific doctoral program objectives are to develop the skills and knowledge necessary to:

- Specialize within one of the subdisciplines of civil engineering;
- Perform independent fundamental research in one of the subdisciplines of civil engineering;
- Produce a piece of fundamental research that advances meaningfully the state of the art of one of the subdisciplines of civil engineering and is publishable in a first-tier refereed civil engineering related journal.

A PhD is granted for the invention or creation of new knowledge in civil engineering. This knowledge may result from analytical, numerical or experimental research. The knowledge may be practical or fundamental in nature.

Admissions

To apply for admission to any Tandon graduate program, please contact the Office of Graduate Admissions (https://engineering.nyu.edu/admissions/graduate/).

Program Requirements

The program requires the completion of 75 credits, comprised of the following:

Course	Title	Credits
Major Area Courses		
Select 45 credits of graduate level courses in consultation with an academic adviser [1]		45
Minor Area Courses		
Select 9 credits of graduate level courses in consultation with an academic adviser [1]		9
Qualifying Exam		
RE-GY 9990	PHD QUALIFYING EXAM [2]	0
Dissertation Research		
Dissertation Research Credits [3]		21
CE-GY 999X	PHD Diss in Civil Engineering Department [4]	
Total Credits		**75**

1. Courses cannot be selected from the School of Professional Studies.
2. The qualifying exam (QE) is the prerequisite to dissertation. Students must pass the QE within 2 years of entering the PhD program.
3. After passing the qualifying exam, students will enroll in dissertation. Once students begin dissertation research, they must enroll in at least 3 credits of the dissertation course each fall and spring semester until graduation. This PhD program requires 21 credits of dissertation.
4. Up to 6 credits of dissertation may come from CE-GY 998X Dissertation Level Research, which students may enroll in prior to passing the QE.

Additional Requirements and Details

Areas of Concentration

Students pursuing the PhD in Civil Engineering must choose to specialize in one of the following subdisciplines of civil engineering:

- Structural Materials and Engineering
- Geotechnical and Geo-environmental Engineering
- Environmental and Water Resources Engineering
- Construction Management and Engineering
- Highway and Traffic Engineering
- Urban Infrastructure Systems

Other focus areas are possible and can be developed with the assistance of faculty advisers. All subject areas must be relevant to the degree sought, and a faculty member must be willing and able to guide the student's research.

Academic Adviser

Every PhD student upon admission is assigned an academic adviser, who is designated by the department head. Any member of the civil engineering faculty may be an academic adviser to a PhD student. The first meeting should take place shortly after receiving an acceptance letter from the Admissions Office. During this first meeting the student's Program of Study should be established. The Program of Study should include a list of the fundamental and advanced topics that will comprise the specific courses, the subject matter for the qualifying exam and possible research areas.

In cases where a student is supported on a research contract, the principal investigator of the contract will normally be the student's academic adviser. Where a student has a particular research interest and is working with a particular faculty member, the student may request that faculty member for his or her academic adviser. In rare cases, when a PhD student enters the program without a prior selection of a major area of study, the initial academic adviser will be the graduate coordinator of the program area. Each PhD candidate reports to two advisory committees: an Academic Advisory Committee and a Dissertation Committee.

Academic Advisory Committee

The Academic Advisory Committee shall have a minimum of 4 faculty members, 3 of whom are from or representing their major area of study, and 1 from their minor area of study. The Academic Advisory Committee guides the PhD student's work through the successful completion of a qualifying examination. A letter signed by the academic adviser and

approved by the department head is placed in the student's file indicating the composition of the Academic Advisory Committee.

Qualifying Examination

The PhD qualifying examination is designed to (1) assess student's fundamental knowledge about their subdiscipline of Civil Engineering, and (2) evaluate the student's ability to conduct PhD-level research, including the ability to approach open-ended questions, reason through complex problems, synthesize and analyze information, and articulate it to others. The qualifying examination is a pass/fail milestone in the PhD process. Every student pursuing a PhD must pass a qualifying examination before becoming a candidate for the PhD. According to NYU Tandon School of Engineering policy, students should take the qualifying exam within their first year of study at NYU Tandon School of Engineering. Students must inform their graduate adviser of the semester that they intend to take the exam. Any student who has been accepted into the PhD program is eligible to take the exam.

The exam consists of two parts, as detailed below:

Part 1: Written Exam

The written exam is to be administered each year in May after the end of the spring semester (the specific date will be determined each year by the Graduate Adviser). Three subjects will be chosen by the student out of a set of four predetermined subjects. The predetermined subjects must correspond to courses offered at NYU Tandon that year. Predetermined subjects, questions, grading rubrics, and solutions will be decided and reviewed by each subdiscipline. Each subject exam will consist of multiple questions that can be completed over the course of an hour, for a total of a three-hour exam. Students will be proctored by a faculty member and will not be allowed to use internet-connected devices.

A passing grade of 70% is required in each subject. For any subject that a 70% or above is not achieved, the student must petition the graduate adviser for a second opportunity to take the subject exam (this does not guarantee permission), which should be administered within 3-months. The student will only be required to retake subjects that they did not receive a grade of 70% or above during an exam.

Part 2: Structured Oral Exam

The oral exam is to be administered within three months of the student passing the written exam. After passing this exam, the student becomes a PhD Candidate.

The oral exam consists of a presentation of a research proposal to the PhD qualifying exam committee. The student will be provided a research topic one week prior to the oral exam, and will be asked to spend that time developing a research proposal that they will present to the committee. The research topic will be within the student's proposed field, but not directly related to their chosen research topic. The exam topic will be formulated by the PhD qualifying exam committee chair, and must be approved by all other members of the exam committee before it is provided to the student.

The oral qualifying exam committee will consist of no less than three committee members, with at least two members belonging to the CUE department. The exam committee will be determined by the exam committee chair (typically the student's PhD adviser).

The oral exam will consist of a 20-minute presentation of the student's proposal, during which they will approach the following questions:

- What is known about the research topic? Students should be able to identify at least three key publications on the topic and describe key findings -- these should be a mix of seminal works and significant recent breakthroughs. Students should be able to explain/replicate methods, experiments, mathematical proofs, and/or assumptions made in those key publications.
- What are research gaps related to the topic?
- What research question and objectives could be implemented to address the identified knowledge gaps? Students are expected to clearly state their research question(s) and hypotheses)
- What experimental methods could be implemented to answer the research question(s)?
- What are the expected outcomes of the research and why?

After the student presentation, each committee member will be allotted up to 20 minutes to ask targeted questions based on the proposed research, or fundamental understanding related to the topics presented. Students will have access to a chalkboard or white board to write out or illustrate concepts.

The following categories provide a structured evaluation of the results to the PhD Qualifying Examination Committee:

- Pass: the student's performance in written and oral parts of the qualifying examination were satisfactory.
- Conditional pass/retake: the student's performance in the oral part of the qualifying examination was not satisfactory. The student will be asked to take the oral exam again, or perform a set of conditions before being granted a passing grade. The committee will define the time frame for completion of the conditions or retake of the examination. A third attempt is rarely permitted only with written approval of the Department Chair.
- Fail: the student's performance in the written and/or oral parts were not satisfactory. When a student fails the PhD qualifying exam, there is no option to retake the exam.

The qualifying exam may be taken home with permission from the program director.

Dissertation Committee

A Dissertation Committee is formed immediately after a student passes the qualifying exam to guide the student's course of study and research work. This committee will serve as a panel of experts to aid the candidate throughout their research.

The Dissertation Committee shall have no less than five members, including a chairperson, a major adviser, and an adviser for each minor the student is pursuing, one of whom must be on the faculty in another NYU Tandon School of Engineering department. One external member who is either a faculty member at another academic institution or a noted PhD-level practitioner is encouraged. Additional faculty members may also serve on the Dissertation Committee. Upon permission of the program director, 4 advisers will be allowed.

The members of the Academic Advisory Committee may also serve on the Dissertation Committee. The membership of the Dissertation Committee must be approved by the department head and recorded with the Office of Graduate Academics.

The major adviser, who may also serve as chairperson, must be a full-time faculty member of the Department of Civil and Urban Engineering. Students should complete the *PhD Guidance Committee* form found on the Graduate Academics website (https://engineering.nyu.edu/

academics/graduate/graduate-student-forms/) to start the process of gathering a Dissertation Committee.

Dissertation Proposal

Upon passing the qualifying exam and the appointment of a Dissertation Committee, the PhD candidate must submit a written Dissertation Proposal outlining the subject of the proposed research. This proposal should be 15 to 20 pages long and should address the following specific items:

1. Description of the topic;
2. Literature review sufficient to ensure original work;
3. Method(s) for the research;
4. Data and/or laboratory needs and their availability; and
5. Anticipated outcomes.

The Dissertation Proposal must be submitted within one year of full-time study after passing the qualifying exam.

The Dissertation Proposal is presented orally and defended before the Dissertation Committee and other interested departmental faculty. The date of the oral defense and copies of the draft Dissertation Proposal must be available to departmental faculty at least two weeks (14 calendar days) before the defense.

When the Dissertation Proposal is formally accepted and defended successfully, the chairperson of the Dissertation Committee shall enter a letter into the student's graduate file, indicating this acceptance, together with a copy of the Dissertation Proposal. While the Dissertation Committee has reasonable flexibility to modify the Dissertation Proposal during the research, any significant change in focus area or methodology requires submission of an amended Dissertation Proposal and formal acceptance as described herein.

Dissertation Defense

The culmination of the student's PhD work is the oral presentation and defense of the final draft dissertation. A defense is generally scheduled after the **Dissertation Defense Committee** reviews the draft dissertation and determines that it is complete and of sufficient quality to be presented and defended.

The defense is organized and scheduled by the Dissertation Defense Committee. The Dissertation Defense Committee shall have no less than 5 members, including a chairperson, a major adviser, and an adviser for each minor the student is pursuing, one of whom must be on the faculty in another NYU Tandon School of Engineering department. One external member who is either a faculty member at another academic institution or a noted PhD-level practitioner is encouraged. Additional faculty members may also serve on the Dissertation Committee. Upon permission of the program director, 4 advisers will be allowed.

All Institute faculty members may observe and ask questions at all NYU Tandon School of Engineering dissertation defenses. Therefore, the date of the defense must be announced Institute-wide at least one month before the event, and copies of the draft dissertation must be available to any faculty member who requests one in a timely fashion and in no case less than two weeks before the defense. The defense of the final draft of the student's dissertation must take place in-person at the Brooklyn campus.

Students should fill out the Dissertation Defense Form (https://docs.google.com/document/d/1vsPiBxx0sMNE-2SxpORG_mUZOGWzAzrGGc8dIOt30dg/edit/?tab=t.0).

Explanation of Requirements

To earn a doctoral degree in Civil Engineering, the following requirements must be met:

Major Requirements

54 credits of graduate course work (not including the PhD dissertation) in relevant major and minor areas of study beyond the bachelor's degree, with an average grade of B or better (cumulative average of 3.0 or better on a 4.0 scale). Up to 6 credits of the 54 credits may be satisfied by individual guided studies, readings, projects and thesis.

Dissertation Defense

Completion and successful defense of a 21-credit dissertation related to the major area of study. Dissertations must consist of original research that meaningfully advances the state of the art in the research subject area and should result in the publication of at least one paper in a strictly peer-reviewed technical journal related to the subject. A grade of B or better must be achieved for the dissertation. There are two types of dissertation credits:

1. CE-GY 998X Dissertation Level Research: Independent original investigation demonstrating creativity and scholarship worthy of publication in a recognized engineering journal. Registration for a maximum of 6 credits is permitted for PhD students prior to passing the qualifying examination. PhD students who passed their qualifying examination should register for CE-GY 999X PHD Diss in Civil Engineering Department.

2. CE-GY 999X PHD Diss in Civil Engineering Department: Independent original investigation demonstrating creativity and scholarship worthy of publication in a recognized engineering journal. Candidates must successfully defend dissertations orally. Registration for 3 to 6 credits per semester is permitted after successfully completing the doctoral qualifying examination, but a minimum of 12 credits must be completed before the defense. Registration must be continuous (excluding summer semesters), unless a formal leave of absence is requested and approved. Registration for 3 to 12 credits is permitted in the final semester of work, with the approval of the department head. *Prerequisites: successful completion of doctoral qualifying examinations and approval of the dissertation adviser*.

Minor Area of Study

Completion of one minor area of study, as follows:

Out-of-Department Minor

Completion of 9 credits of graduate course work in one technical area of study; OR

In-Department Minor

Completion of 9 credits of graduate course work in a minor area outside the major subdiscipline in civil engineering.

Urban Science Doctoral Track

The optional Urban Science Doctoral Track (https://engineering.nyu.edu/urban-science-sensing-complexity-informatics-doctoral-track/) is specifically designed for students who want to focus on urban science through a cohesive array of in-class and experiential learning activities,

while pursuing their PhD at NYU Tandon. Doctoral track students will engage with CUSP's urban science faculty, experts in methodological aspects pertaining to complexity (dynamical systems, multi-agent systems, network science, and risk engineering), informatics (AI, machine learning, and robotics), and sensing (Internet of Things, smart infrastructure, wireless).

Additional Requirements

In satisfying these basic PhD requirements, students also must satisfy one of the two following conditions:

1. 48 credits of relevant graduate course work, not including individual guided studies (readings, projects, theses, etc.) beyond the bachelor's degree, with an average grade of B or better (cumulative average of 3.0 or better on a 4.0 scale).
2. 24 credits of approved graduate course work, not including individual guided studies (readings, projects and theses) beyond the master's degree, with an average grade of B or better (cumulative average of 3.0 or better on a 4.0 scale). Satisfying this condition requires that the department accept the student's MS degree *in toto*, as a blanket 30 credits, without regard to its specific content. This acceptance requires a recommendation from the department's Graduate Committee and department head approval.

Journal Publication

Although publication is not required as a condition for graduation at this time, journal publication is strongly encouraged. Every PhD candidate is expected to generate knowledge worthy of publication in two or more reputable journals.

Sample Plan of Study

Course	Title	Credits
1st Semester/Term		
Major Area Course		3
Major Area Course		3
Minor Area Course		3
	Credits	**9**
2nd Semester/Term		
Major Area Course		3
Major Area Course		3
Minor Area Course		3
RE-GY 9990	PHD QUALIFYING EXAM	0
	Credits	**9**
3rd Semester/Term		
Major Area Course		3
Major Area Course		3
Minor Area Course		3
	Credits	**9**
4th Semester/Term		
Major Area Course		3
Major Area Course		3
Major Area Course		3
	Credits	**9**
5th Semester/Term		
Major Area Course		3
Major Area Course		3
Major Area Course		3
	Credits	**9**
6th Semester/Term		
Major Area Course		3
Major Area Course		3
Major Area Course		3
	Credits	**9**
7th Semester/Term		
CE-GY 999X	PHD Diss in Civil Engineering Department	3
	Credits	**3**
8th Semester/Term		
CE-GY 999X	PHD Diss in Civil Engineering Department	3
	Credits	**3**
9th Semester/Term		
CE-GY 999X	PHD Diss in Civil Engineering Department	3
	Credits	**3**
10th Semester/Term		
CE-GY 999X	PHD Diss in Civil Engineering Department	3
	Credits	**3**
11th Semester/Term		
CE-GY 999X	PHD Diss in Civil Engineering Department	3
	Credits	**3**
12th Semester/Term		
CE-GY 999X	PHD Diss in Civil Engineering Department	6
	Credits	**6**
	Total Credits	**75**

Learning Outcomes

Upon successful completion of the program, graduates will:

1. Specialize within one of the subdisciplines of civil engineering.
2. Perform independent fundamental research in one of the subdisciplines of civil engineering.
3. Produce a piece of fundamental research that advances meaningfully the state of the art of one of the subdisciplines of civil engineering and is publishable in a first-tier refereed civil engineering related journal.

Policies

Program Policies

Transfer Credits

A maximum of 48 credits of approved graduate work may be transferred. Transfer credits for PhD students may be awarded on a course-by-course basis or by the transfer of a MS degree from another institution in satisfaction of 30 graduate credits. The latter requires a recommendation from the department's Graduate Committee and the approval of the department head. Transfer credits are generally awarded at the time of admission and must be approved by the academic adviser, the graduate coordinator and the department head.

Residency Requirement

Residency requirements for the PhD in Civil Engineering include the 21-credit dissertation plus a minimum of 6 credits of applicable graduate course work taken at NYU Tandon School of Engineering.

NYU Policies

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

Tandon Policies

Additional academic policies can be found on the Tandon academic policy page (https://bulletins.nyu.edu/graduate/engineering/academic-policies/).