Bulletin Home

NYU Tandon School of Engineering Address

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New York University Tandon School of Engineering Mission Statement

To excel as a leading high-quality research university engaged in education, discovery and innovation with social, intellectual and economic impact in the New York region, the nation and the world.

To achieve this mission, we educate, discover and invent. We engage students seeking educational achievement and opportunity, faculty seeking excellence and relevance, and organizations seeking solutions and talent. We creatively bring intellectual rigor, technological innovation and a passion for science to the communities where we work and live and to the citizens of the world.

We innovatively extend the benefits of science, engineering, management and liberal studies to critical real-world opportunities and challenges, especially those linked to urban systems, health and wellness and the global information economy.

Our learning environment develops the skills to discover and invent, stimulates innovation and encourages entrepreneurship. We refer to this environment of invention, innovation and entrepreneurship as i^2e. It is what has produced generations of thought leaders and action-oriented learners who are capable of thinking globally and across multiple disciplines.

General Information

The New York University Tandon School of Engineering bulletin is an official publication of NYU. It provides information about academic programs and a summary of School policies and procedures and selected activities and services. Information concerning admission, academic regulations and requirements, student services, academic offerings and a listing of administrative officers and faculty are included. Every effort has been made to publish a complete and accurate bulletin. However, requirements, deadlines, tuition, fees, curricula, courses and staffing are subject to change at any time without advance notice or obligation. Some course descriptions may vary from actual course content because of advancements in the discipline, emphasis of individual instructors or decisions of the faculty to change the scope or content of the course.

School Profile

Introduction

The New York University Tandon School of Engineering (formerly the Brooklyn Polytechnic Institute, the Polytechnic University, the Polytechnic Institute of NYU, the NYU Polytechnic School of Engineering, and now widely known as NYU Tandon) is the official engineering school of New York University. NYU Tandon School of Engineering, founded in 1854, is the nation's second oldest private engineering school. It is presently a comprehensive school of education and research in engineering and applied sciences, rooted in a 159-year tradition of invention, innovation, and entrepreneurship. It remains on the cutting edge of technology, innovatively extending the benefits of science, engineering, management and liberal studies to critical real-world opportunities and challenges, especially those linked to urban systems, health and wellness, and the global informational economy. In addition to its programs on the main campus in New York City at MetroTech Center in downtown Brooklyn, it offers programs around the globe remotely through it's online courses. NYU Tandon School of Engineering closely connected to engineering in NYU Abu Dhabi and NYU Shanghai and to the NYU Center for Urban Science and Progress (CUSP) also at MetroTech, while operating four future labs in downtown Manhattan and Brooklyn.

Undergraduate programs in civil, computer, chemical, electrical and mechanical engineering are accredited by the Accreditation Board for Engineering and Technology (ABET). Degree and certificate programs listed in this bulletin are registered by the New York State Education Department.

History

Founded in 1854 as the Brooklyn Collegiate and Polytechnic Institute, the school originally educated young men, ages 9 to 22, and was located on Livingston Street in downtown Brooklyn. In 1889, the collegiate and preparatory departments separated, and the collegiate division adopted the name Polytechnic Institute of Brooklyn. The Institute, historically referred to as "Brooklyn Poly," moved its campus to Jay Street in 1957. In 1961, it opened a Long Island campus in Farmingdale as a graduate and research center.

In 1973, the New York University School of Engineering and Science merged into Polytechnic and the school was renamed the Polytechnic Institute of New York. The Institute began offering undergraduate programs at its Long Island campus in 1974 and, in 1975, opened the Westchester Graduate Center in Hawthorne. As a result of institutional realignment, the Hawthorne campus was closed in August 2013, and the Long Island Campus is only operating programs for continuing students, and will be closed as of May 2014.

In 1985, the New York State Board of Regents granted the institution university status and the official name became Polytechnic University.

The next 15 years saw a period of great activity as the University played a key part in the creation of MetroTech Center, a 16-acre, $1.5-billion university-corporate park, which was built around Polytechnic's existing buildings and revitalized an area that had been in decline. Polytechnic updated its facilities, renovated its student-center building and built a new home for its library and for the Center for Advanced Technology in Telecommunications. The University also began to offer several programs in management of technology and financial engineering in the heart of Manhattan's high-technology and financial district.

During this time, the University launched the Campaign for Polytechnic - Fulfilling the American Dream - to raise $275 million to transform itself into one of the nation's premier technological universities. In 1998, Polytechnic received a $175 million bequest from the estates of Donald F. Othmer, a longtime Polytechnic professor, and his wife, Mildred. At that time, it was the largest single cash gift ever made to a private American university. In 1999, Polytechnic received its second largest contribution from alumnus and former student of Professor Othmer, Joseph J. Jacobs, who gave $20 million.

In 2000, Polytechnic began construction on two new buildings on the MetroTech campus: the Joseph J. and Violet J. Jacobs Building, an eight-story academic and athletic facility with classrooms and laboratories and a full gymnasium; and the 20-story, 400-bed Donald F. and Mildred Topp Othmer Residence Hall, Polytechnic's first on-campus residence hall in Brooklyn. Both buildings opened in summer 2002. Since that time, the NYU School of Engineering has expanded into all four sides of MetroTech, while enhancing its existing facilities.

In 2008 the University entered into a formal affiliation with New York University in recognition of the synergies between engineering, science, technology, medicine, dentistry, public policy, law and the arts. It became known as the Polytechnic Institute of New York University, or informally as NYU-Poly, the affiliation has further enhanced its capability to prepare leaders to address the challenges of the 21st century. In 2012, the Board of Trustees of NYU and the Board of Trustees of NYU-Poly voted for the institutions to undertake the final set of steps necessary to complete the merger and make NYU-Poly NYU's School of Engineering. Since that time, key approvals, from state and accrediting authorities have put the merger on track. It was finalized as of January 1, 2014, at which point NYU-Poly became the newest school at NYU: the NYU Polytechnic School of Engineering. Thanks to a visionary and generous donation made in 2015, the school was renamed the NYU Tandon School of Engineering.

The NYU Tandon School of Engineering delivers on-site and online programs locally and globally. NYU Tandon students also have the ability to study abroad at NYU's global sites and other affilitated international universities.

Academic Programs

The NYU Tandon School of Engineering offers a Bachelor of Science degree in 15 disciplines, covering computer science, engineering, the physical sciences, mathematics, and liberal arts. A Master of Science is offered in 26 disciplinary specialties. A Doctor of Philosophy is offered in 9 disciplines.

Bachelor of Science programs prepare students for entry-level employment in various professional disciplines, and for study at an advanced level. Master of Science programs are oriented toward professional development in the subject area and can be arranged to provide the core coursework for PhD study. The PhD is the terminal research degree for those who seek careers in industrial or academic research. The degree requires an independent research dissertation that advances the state of the art in the discipline of study. Details of academic degree requirements and detailed program descriptions are given in "Academic Programs" section of this bulletin.

Academic Departments

The School faculty is grouped into academic departments for administrative purposes. Each degree program is planned and administered by the faculty of a department (or, in some cases, by faculty from several cooperating departments). Academic departments manage instructional laboratories and most research laboratories.

The "Academic Departments" section of this bulletin describes the faculty and facilities of the following eleven academic departments, and identifies the degrees that each department supervises.

- Applied Physics
- Biomedical Engineering
- Chemical and Biomolecular Engineering
- Civil and Urban Engineering
- Computer Science and Engineering
- Electrical and Computer Engineering
- Financial and Risk Engineering
- Mathematics
- Mechanical and Aerospace Engineering
- Technology, Culture and Society
- Technology Management and Innovation

Research at the NYU Tandon School of Engineering

The NYU Tandon School of Engineering offers major research programs in experimental, theoretical and computational areas, leading to significant contributions in the advancement of technology. The NYU Tandon School of Engineering faculty continue to excel as world leaders in areas that include power engineering, electromagnetics and wave propagation, wireless communication and networks, telecommunication and distributed information systems, cybersecurity, data management, software engineering and development, polymer chemistry and engineering, dynamical systems, smart materials, biomaterials, bioengineering, engineered interfaces, plasma science and technology, sensors and sensor systems, urban engineering relating to urban infrastructure, resiliency, and smart cities.

Future Labs and Accelerators

As the innovation economy emerges around the world, New York City has been diversifying its efforts to nurture a fast-growing sector of technology companies. The NYU Tandon School of Engineering operates four future labs for early-stage startups with a network of support services and programs, which are a key component of the school's strategy of i2e (invention, innovation and entrepreneurship). The future labs - located on Varick Street in Manhattan, DUMBO, Sunset Park, and the Urban Future Lab (UFL) on its main campus at 15 MetroTech Center in Brooklyn - provide guidence, expertise, and resources to entrepreneurs, helping their ventures grow, while attracting talent and funding to the School. The UFL is the School's hub for all cleantech related avtivities and houses ACRE, the Accelerator for a clean and Renewable Economy, and PowerBridgeNY, a cleantech proof-of-concept center. The incubators are a public-private-academic partnership where young entrepreneurs are nurtured by university partners with support from government and the private sector. They provide startups with administrative support in addition to access to talent, markets, capital, research and resources.

Intellectual Property

The School's written policy on intellectual property governs the rights, benefits and releases related to faculty and student project work. The policy is available from the NYU Office of Industrial Liaison.

Faculty

The heart of the NYU Tandon School of Engineering is its teaching and research faculty. There are more than 150 full-time faculty, in addition to adjunct faculty, teaching and research assistants, scientists and postdoctoral and special fellows. The NYU Tandon School of Engineering faculty is committed to providing the best possible educational environment to stimulate and develop the mind-set of inventors, innovators and entrepreneurs in the classroom and in the laboratory, through individual guided studies and projects, advising and strong one-on-one relationships with students. The faculty originates, organizes and approves all curricula taught at the School and also establishes academic standards for student performance.

Alumni

The NYU Tandon School of Engineering Alumni Association (PIAA), which traces its roots to 1863, promotes the welfare of alumni and the Institute through the support and advancement of continuing education, communication, fundraising, student recruitment and retention and fellowship among alumni. The association is governed by an elected

Executive Council and an International Board of Directors. The NYU Tandon School of Engineering's more than 33,000 living alumni can be found in all 50 states and at least 64 countries.

The PIAA, coordinating with the Office of Development & Alumni Relations, provides unique engagement opportunities that benefit alumni worldwide, including international and regional alumni gatherings and various networking and social programs organized by class year, discipline, affinity and other criteria.

Each year, the PIAA recognizes alumni accomplishments with the Distinguished Alumni Award, Dedicated Alumni Award and Outstanding Graduate Award, which are presented during Commencement and other prestigious events.

NYU Tandon School of Engineering alumni are encouraged to take advantage of a number of services and benefits available through the Office of Alumni Relations. Benefits include the opportunity to audit NYU Tandon School of Engineering courses at reduced tuition, use of the Bern Dibner Library of Science and Technology, access to online job listings through NYU CareerNet, the services of the Wasserman Center for Career Development | Brooklyn, use of the NYU Federal Credit Union, access to the NYU Travel Adventures program, as well as discounted life, health, auto and home insurance programs. As the newest members of the NYU alumni family, NYU Tandon School of Engineering alumni also enjoy benefits and services which may be found by visiting http://alumni.nyu.edu/s/1068/2col.aspx?sid=1068&gid=1&pgid=254.

Sites

Brooklyn

NYU Tandon School of Engineering's campus is in the center of downtown Brooklyn, a vibrant residential and business community and cornerstone of the emerging "Brooklyn Tech Triangle". The campus forms the nucleus of MetroTech Center, the largest urban university-corporate park in the United States. Developed in 1982, the 16-acre, $1-billion complex features a tree-lined commons and pedestrian walkways and is home to several technology-dependent companies that have fostered research and employment relationships with the Institute. Its academic buildings create an environment that facilitates faculty, student and staff interactions in laboratories, project space and study space, which together encourage invention, innovation and entrepreneurial activities both in and outside the classroom.

- Rogers Hall, the main academic building, is named after the late Harry S. Rogers, NYU School of Engineering's fifth president (1933-57). The building houses faculty and department offices, classrooms, research and teaching laboratories and a cafeteria, dining hall, student lounge, and a new students "ideation" and collaboration space called the Greenhouse.
- Bern Dibner Library of Science and Technology opened in 1992, provides 128,000 square feet of academic and student services space. The building houses several key elements of the Institute: a state-of-the-art library, named after the late Bern Dibner '21 Hon'59, an alumnus, trustee and benefactor; computer laboratories; the Departments of Technology Management and Innovation, Technology, Culture and Society, and part of the Electrical and Computer Engineering department; the center for Faculty Innovation in Teaching and Learning; and the Expository Writing Program, administered by NYU. The second floor of the building houses the Student Services and Support Center, providing students convenient access to the services they need - all under one roof. Opened in 2012, the center provides Student Affairs, Student Clubs, a Student Lounge, Office of Global Services, Counseling Services, the Registrar/Financial Aid/Bursar one-stop shop; and Undergraduate Programs Offices, including Advisement, Special Services/TRIO, HEOP, and General Studies (GS).
- Joseph J. and Violet J. Jacobs Academic Building, opened in 2002, honors the late inventor, innovator and entrepreneur Dr. Jacobs '37 '39 '42 Hon'86, founder of Jacobs Engineering Group, former chairman of the Board of Trustees, and his wife. The eight-story building, the main entrance to the School, contains lecture halls; laboratories for chemistry, biology and environmental engineering; and "smart" classrooms wired for multimedia technologies. The building also features a full multipurpose gymnasium, including a fitness center and basketball court.

- 2 MetroTech Center recently became a new hub for the entire Computer Science and Engineering (CSE) Department and part of the Electrical and Computer Engineering (ECE) Department. NYU School of Engineering's space in the building is split among three floors - a dedicated ground-floor lobby, the entire 10th floor and a portion on the 9th floor. The 50,000 square foot space on the building's 10th floor, opened in January 2012, includes: 47 faculty and researcher offices, more than a dozen computational laboratories, work stations for post-docs and student researchers, and department administration and advising offices. A pantry and break room adjacent to the glass-enclosed data monitor room offers a view of the lab conducting research on data analysis and visualization. The 35,000 square feet on the buildings 9th floor underwent renovations to create three, large-capacity classrooms, new permanent homes for the Center for Advanced Technology in Telecommunications (CATT) and NYU WIRELESS, the largest National Science Foundation-funded academic/industry cooperative research center. The 9th floor space was substantially completed in January 2013. In the fall of 2013, New York University launched the Media and Games Network (MAGNET), on the 8th floor of 2 MetroTech Center that bring together NYU Tandon School of Engineering faculty and faculty from other schools of NYU whose teaching and research bridge technology and culture.
- Donald F. and Mildred Topp Othmer Residence Hall, opened in 2002, honors the late Dr. Othmer, a long-time professor of chemical engineering and prolific inventor (1932-76) and his wife. The 20-story building houses more than 400 students in two-bedroom suites and two-bedroom apartments with kitchenettes and data, voice and cable television ports for every student. The building includes student lounges, study rooms, laundry facilities, health offices and storage space.
- Joseph W. and Samuel Wunsch Hall is housed in a historic landmark. Anchoring the third side of the MetroTech campus, it was built in 1846. This Greek Revival building was the home of the African Wesleyan Methodist Church, the first black congregation in Brooklyn and was a stop on the Underground Railroad. It was authentically restored and reopened in 1996 through the generosity of the Wunsch family, in memory of two entrepreneurial brothers and alumni Joseph '17 and Samuel Wunsch '29. The building houses the Office of Undergraduate and Graduate Admissions.
- 15 MetroTech Center, 6th floor, is home to the administrative functions of the NYU Tandon School of Engineering including: the Office of the President, Office of Sponsored Research, Information Technology, Finance and Business Affairs, Human Resources, Development and Alumni Relations, Enterprise Learning and ePoly, Marketing & Communications and Web & Media Services. In the fall of 2013, NYU Tandon School of Engineering opened a 10,000 square foot incubator on the 19th floor of 15 MetroTech Center, a project supported by the NYC Economic Development Corporation.

55 Broad Street, Manhattan Programs

Located in the heart of New York City's high-technology and financial district, NYU Tandon School of Engineering's 55 Broad Street site allows the Technology Management Department to serve the area's burgeoning population of technology managers, financial experts, entrepreneurs and other professionals.

Master's degrees offered at this site through the Department of Technology Management include Accelerated Management of Technology and Management of Technology, along with an Information Management Master's degree program taught in an executive-degree format. The 55 Broad Street site also houses the Department's Institute for Technology and Enterprise (ITE). ITE presents seminars and roundtables on various subjects related to modern technology management and supports research and advanced curriculum development for graduate and executive master's programs dealing with technology and innovation management and entrepreneurship.

Global Outreach

In addition to its programs on the main campus in downtown Brooklyn, the NYU Tandon School of Engineering offers programs around the globe remotely through online courses. NYU Tandon School of Engineering is closely connected to engineering in NYU Abu Dhabi and NYU Shanghai as well as to the NYU Center for Urban Science and Progress

(CUSP) also located at MetroTech, while operating three future labs in downtown Brooklyn and Manhattan. In addition, as discussed throughout, students and faculty enjoy many opportunities to take advantage of the resources and broader community in Manhattan at Washington Square and along the Medical Corridor on First Avenue and around the globe.

Administration

The Administration

Office of the Dean

Jelena Kovačević
Dean,Tandon School of Engineering

Leadership Team

Rose Ampuero
Assistant Dean of Student Affairs

Kurt Becker
Vice Dean for Research, Innovation and Entrepreneurship

Pat Bowers
Vice Dean, Finance and Administration

Jack Bringardner
Assistant Dean for Academic and Curricular Affairs, Industry Assistant Professor

Elizabeth Ensweiler
Senior Director of Graduate Enrollment and Graduate Admissions

Anita Farrington
Associate Dean for Student Affairs

Jean Gallagher
Director of Faculty Development, Professor

Nicole Johnson
Assistant Dean for Opportunity Programs

Cindy Lewis
Director of Undergraduate Enrollment Management

Sayar Lonial
Associate Dean for Communications and Public Affairs

Karine-Frederique Loriot
Associate Dean of Tandon Career Services

Nasir Memon
Vice Dean for Student and Academic Affairs, Professor

Melinda Parham
Assistant Dean for First-year Students and Academic Initiatives

Lauren Ptak
Chief Marketing Officer

Sravani Ramisetti
Senior Advisor to Dean

Allison Taylor
Associate Dean for Strategic Initiatives & Chief of Staff

Erin Varga
Associate Dean for Development

Peter Voltz
Associate Dean for Undergraduate and Graduate Academics, Associate Professor

Yao Wang
Associate Dean for Faculty Affairs, Professor

Department Chairs and Speaker of the Faculty

John DiBartolo
Chair, Applied Physics

Andreas H. Hielscher
Chair, Biomedical Engineering

David Pine
Chair, Chemical and Biomolecular Engineering

Magued Iskander
Chair, Civil and Urban Engineering

Guido Gerig
Chair, Computer Science and Engineering

Ivan Selesnick
Chair, Electrical and Computer Engineering

Peter Carr
Chair, Finance and Risk Engineering

Richard Thorsen
Chair, Mechanical and Aerospace Engineering

Jonathan Soffer
Chair, Technology, Culture and Society

Oded Nov
Chair, Technology Management and Innovation

Shivendra Panwar
Speaker of the Faculty

Admissions, Financial Aid, Tuition and Fees

Admissions

The courses of study at NYU Tandon School of Engineering are academically rigorous and intellectually challenging; therefore, admission is highly selective. Candidates for admission to graduate programs are evaluated by the department to which they apply. Students seeking admission to the undergraduate programs are evaluated by the professional staff of the Office of Undergraduate Admissions.

**Due to COVID-19, Admissions will have updates throughout the year that will be updated in real time.*

Undergraduate Application Process

Application materials and information about undergraduate admissions may be obtained by contacting the Admissions Office. Please visit the NYU Admissions website for more information.

Undergraduate applicants should complete the Common Application for admission and forward it to the Office of Undergraduate Admissions at New York University with either the nonrefundable application fee or a fee-waiver request form. Applicants must request that their secondary school and/or college forward official copies of all transcripts to the NYU Office of Undergraduate Admissions. Additionally, applicants must submit their essays and two letters of recommendation. All freshman applicants must meet standardized testing requirements, which are available on the Undergraduate Admissions website. Transfer applicants may have standardized testing requirements as well.

**Please note that due to COVID, Admissions is being flexible this year. Please click here for more information.*

New York University's Office of Undergraduate Admissions reviews applications once all required documents are received.

If accepted for admission, applicants should submit an enrollment deposit of $500 to reserve a place in the entering class. This deposit is applied to tuition and fees for the first semester and is non-refundable. Deposits to reserve a place in the entering freshman class are due May 1. Deposits to reserve a place for entering transfer students specified on the admission letter. Students who submit deposits after the deadline will be accommodated only if space in the class is available for the semester.

Applicants accepted for the fall semester may begin their studies in the summer session by completing a visiting student admission application after receiving their official offer of admission. NYU Tandon School of Engineering offers two summer sessions to help students who wish to accelerate or supplement their studies, but students are not expected to officially matriculate as degree-seeking candidates until the Fall.

Admission as First Year Students

Requirements

Applicants for admission as freshmen are required to submit standardized test results to be considered for admission. If submitting SAT Subject Test, AP, or IB scores, please include one literature or humanities score, one math score, and one science score. Please see the NYU admissions website for specifics on the testing policy. Students who are admitted to the NYU Tandon School of Engineering and plan on enrolling are required to take two placement examinations before registration.

The preferred secondary school course of study is:

Course	Years
English	4
Science	4
(Chemistry is required and Physics is strongly recommended.)	
Mathematics	4
(Sequential I, II, III, precalculus, calculus)	

This course of study is only a directive, not an absolute requirement. The primary concern of the members of the Committee on Admissions is to determine an applicant's potential for success at the NYU Tandon School of Engineering.

First Year Students with Advanced Standing

Incoming first year students may receive advanced standing with college credit at NYU by scoring exceptionally well on the Advanced Placement Examinations given by the College Board. Specific requirements for administering college credit - for the Advanced Placement and the International Baccalaureate Exam, for the French Baccalaureate or for the General Certificate Exam A Levels, etc. - vary from department to department. Currently, no department at NYU Tandon accepts FB or A Level credits.

Admission under the General Studies Program

Admission to the General Studies Program is by invitation only. Selected first-year applicants to the NYU Tandon School of Engineering are invited to submit an application and may be interviewed by an admissions counselor to determine if their goals correspond with program objectives and services.

Academic Support Services

GS students have an array of services to help them adjust to the rigorous NYU Tandon School of Engineering curriculum. Services include, but are not limited to, the following:

- A six-week on-site or online summer program before the start of their first year.
    - On-site students take a computer skills for engineerings class and pre-college math, physics, and writing courses. Otherwise, students take an online math course. NYU Admissions decides whether the student's summer experience will be on-site or online; regardless of format, student participation in one or the other is required for admission to the NYU School of Engineering in the fall.
- College survival skills course.
- Small group tutoring and exam review sessions.
- Individual and group advisement sessions.

Admission under the Higher Education Opportunity Program

The Higher Education Opportunity Program (HEOP) is funded by New York State to provide broad and varied educational instruction to capable students who, due to limited academic and financial resources, might otherwise not have the opportunity to attend NYU. Once admitted to the HEOP program, students receive financial assistance, counseling, tutoring, advisement, and other support services throughout their college career. HEOP's goal at the NYU

Tandon School of Engineering is to retain and graduate students who are traditionally underrepresented in engineering and science. Students can also be considered for CSTEP (Collegiate Science and Technology Entry Program).

Admission as an International Student

International students must meet the following criteria for admission to NYU Tandon School of Engineering and be eligible to receive a valid I-20 or DS-2019:

- Academic credentials (grades, certificates, degrees) must be assessed as suitable for entry to the specific NYU School of Engineering program. Transcripts must be submitted with official translations. One source for official translations is World Education Services at www.wes.org.
- Submission of standardized testing is required for first year student admission (www.nyu.edu/admissions/undergraduate-admissions/apply/freshmen-applicants/instructions/standardized-tests.html).
- The Test of English as a Foreign Language (TOEFL) or IELTS is required of all students whose native language is not English. Students who have done 3 or more years in an English curriculum are exempt. Waivers for English language testing may be found here.
- Admitted international students applying for an F-1 or J-1 student visa are required to submit a signed and completed NYU Declaration and Certification of Finances (Affidavit of Support) accompanied by a bank statement signed by a bank official to receive an I-20 or DS- 2019.
- Students holding F-1 or J-1 visas must enroll as full-time students.

If transfer credit is desired, candidates must include catalog or syllabus descriptions of courses completed. English translation must be provided where necessary. An official transfer-credit evaluation will be done, as soon as possible, after the student is admitted to NYU Tandon School of Engineering and meets with a member of the admissions staff and a departmental adviser.

Admission as a Transfer Student

The NYU Tandon School of Engineering welcomes transfer students from accredited colleges and universities, provided they have maintained a strong academic record. In addition to the Common Application transfer applicants must submit the following to be eligible for transfer admission at NYU:

- One Instructor Evaluation completed by a professor or instructor at the college/university level.
- Official test scores that meet the University requirements for Standardized Tests. Transfer applicants who have already completed at least one year of full-time college or university enrollment by the time they apply are exempt from having to submit standardized test results to NYU. International transfer applicants, however, must review the English language testing requirements, which apply to both freshman and transfer candidates. If the applicant has not already completed one full year of full-time college or university enrollment by the time the application is submitted, the same standardized testing requirements that are outlined by Undergraduate Admissions on the Standardized Tests page for Freshman Applicants must be met.
- The Common Application College Official's Report submitted by an adviser or a school official who can verify previous or current enrollment at a college/university.
- Official college/university transcripts submitted directly by the college/university registrar at any and all institutions attended.
- The Common Application Final Report and secondary/high school transcript submitted directly by a counselor or school official at the secondary/high school attended. Please note: Secondary/high school transcript (or General Education Diploma) is required regardless of when the applicant graduated.

Once accepted, transfer students' credits will be evaluated to determine which are transferable. Students are required to submit their college catalog, and/or syllabi, describing courses under consideration for transfer credit.

All transfer credit evaluations must be completed before the end of the first semester in which the transfer student is enrolled at the NYU Tandon School of Engineering. Transfer credit is awarded on the basis of current standards and curriculum. Therefore, it is possible that credits NYU Tandon School of Engineering had previously awarded for courses taken at other universities may no longer be granted at this time. Transfer credit will not be considered for any course with less than a C grade. Any student who completes a course in residence at NYU Tandon School of Engineering for which transfer credit has already been granted will automatically forfeit the transfer credit for that course.

In certain instances, course requirements may be waived for students who demonstrate sufficient knowledge of specific course content through either oral or written examinations given by the department. When course requirements are waived, the student will not receive credit for the course, but must substitute a more advanced course to satisfy the degree requirement.

The grades for transfer courses are not included in computing the NYU Tandon School of Engineering grade-point average. New transfer students may be admitted on a part-time or full-time basis and are required to take a mathematics diagnostic examination and a writing placement exam.

Admission as an Internal Transfer

If a student who currently attends another school of NYU would like to be considered for admission to NYU Tandon, he/she may utilize the online internal transfer application in Albert's Application Center.

In order to be eligible to submit an application to start in their third semester, students must be in at least their second semester of consecutive full-time study at their current NYU school or college. Students who have previously applied for an internal transfer and were denied admission must wait one full academic year before becoming eligible to reapply. Likewise, students who have already completed an internal transfer must wait one full academic year before applying for another.

There is no application fee for internal transfers. They may submit only one application at a time. Applications submitted after the stated application deadline will be considered only on a space-available basis. Visit the Internal Transfer website for more information.

Admission as a Part-Time Student

Students seeking a bachelor's degree may enroll on a part-time basis (11 credits or less). Part-time undergraduate students should be aware that it is not possible to complete a bachelor's degree program by attending only evening courses.

Regulations concerning subject requirements and admissions procedures are given in the section "Admissions as a First Year Student."

Following notification of acceptance, students are told when to contact the adviser of their major department. In some cases, this contact may be accomplished during registration.

Special and Visiting Status

Individuals interested in pursuing undergraduate coursework at the School of Engineering, must submit a visiting student application to the Office of University Programs. University Programs provides support and services to visiting students during all semesters, including Fall in NY, January Term, Spring in NY, and Summer Sessions. Additional information regarding available programs and the application process can be found on the NYU Visiting Students page.

Conditional Status

An undergraduate degree applicant who is required to demonstrate additional ability to pursue the program applied for is assigned conditional status. Conditions may include taking introductory level courses, limited courses per semester, or attainment of a specified grade-point average.

Status

Within the full-time and part-time classifications of undergraduate admissions are three status groups: regular, conditional and special/visiting student. A change in status from conditional to regular should be applied for when the conditions of admission are satisfied. A special or visiting student must file an application for undergraduate admissions with the Office of Undergraduate Admissions.

Readmission

NYU Tandon students who have not been in attendance for one semester or more and have not been granted an approved leave of absence (see "Leave of Absence") must apply for readmission through the Office of Undergraduate Admissions. The student's application for readmission will be sent to the student's academic department for evaluation. The academic department in consultation with the Office of Academic Affairs determine whether the student is eligible to continue his/her studies at the School. If a former Tandon student has, in the meantime, engaged in coursework at another college or university, a transfer application must be filed for admission consideration.

Students who have been academically disqualified must apply for readmission through the Office of Undergraduate Admissions. Students applying for readmission are expected to state their reasons for leaving Tandon and explain why they want to return.

Graduate Admissions

The Office of Graduate Enrollment Management and Admissions (Wunsch Hall, Brooklyn NY 11201, (646) 997-3182) manages all graduate application requirements and processes for the Tandon School of Engineering and reserves the right to change requirements at any time in consultation with the Associate Dean for Graduate Academics. The guidelines and requirements in this catalog and on the Graduate Enrollment Management and Admissions website supersede graduate admissions information posted or referenced elsewhere.

To be eligible for admission as a graduate student, an applicant must first hold a bachelor's degree from an accredited institution acceptable to the NYU Tandon School of Engineering comprised of at least four years of post-secondary work. An applicant applying to a graduate program in an area of study different from the field in which an undergraduate degree was earned may be required to take additional prerequisite courses (see "Conditional Status" below).

Admission Procedures

All applicants for graduate study must submit:

- Graduate application and application fee submitted by published deadline
- Two letters of recommendation
- A Statement of Purpose
- A resume / C.V.

- Required official standardized test scores sent from testing organization(s)
- Official transcripts from all previously-attended post-secondary institutions

Documents that must be mailed should be sent to NYU Tandon School of Engineering, Graduate Admissions Processing Center, 458 Pike Road, Huntingdon Valley, PA 19006.

Application Deadlines

Application deadlines for each semester are published on the Office of Graduate Enrollment Management and Admissions website at http://engineering.nyu.edu/grad/.

Graduate Admissions Examinations

The Graduate Record Examination (GRE) or Graduate Management Admission Test (GMAT) is required for all applicants for admission to all doctoral programs and all full-time Master's and Certificate programs, with the exception of the M.S. in Integrated Digital Media. GMAT scores may be used only for certain programs offered by the Department of Technology Management and Innovation. Some part-time Master's and Certificate programs also require these examinations; a complete list of exam requirements by program can be found on the Office of Graduate Enrollment Management and Admissions website at http://engineering.nyu.edu/grad/.

English Language Proficiency

All applicants to the NYU Tandon School of Engineering for graduate study must demonstrate excellent English language skills in reading, writing, speaking and comprehension. Proficiency will be determined by the TOEFL (Test of English as a Foreign Language), IELTS (International English language Testing System), CAE (Cambridge Advanced English), Duolingo English Test or PTE (Pearson Test of English) Academic exams.

The Office of Graduate Enrollment Management and Admissions reserves the right to request proof of English competency from any applicant. At least one of these exams is required for:

1. All International applicants (those who have or will request a visa)
   OR
2. Applicants whose first language is not English and/or who have not completed a bachelor's degree in the United States.

Applicants may request a waiver of English language testing by submitting a request form to the Office of Graduate Enrollment Management and Admissions prior to the posted application deadline (this form is available at http://engineering.nyu.edu/grad/).

Graduate Admission Status

Within the full-time and part-time classifications of graduate admission are three status groups: regular, conditional and special.

Regular Status

An admitted graduate applicant who is adequately prepared to begin graduate studies is assigned regular admission status with no conditions to meet upon the recommendation of the major department's faculty.

Conditional Status

Conditional status is assigned to a graduate applicant who is required to demonstrate additional ability to pursue the program for which he or she applied. Conditions may include taking introductory level or undergraduate courses, providing proof of degree completion, or attaining a specified grade-point average. Conditional admission requirements take precedence over other university policies regarding academic status. Students who do not satisfy the conditions of their admission will be academically disqualified.

Visiting Student (Non-Matriculated) Status

Students may be enrolled as either visiting or non-degree students at the discretion of the department and with the approval of the Office of Graduate Academics. Such status allows visiting students to take courses with the intent of transferring their credits back to their home institution and for non-degree-seeking students to take courses for professional or personal development.

To qualify for visiting student status, applicants must provide a transcript indicating their enrollment in a graduate program at another accredited institution. Applicants must show that they are in good standing with the home institution. To qualify for non-degree status, applicants must show proof of a bachelor's degree (or its equivalent) with a cumulative grade point average of at least 3.0.

A maximum of 6 credits may be taken in one semester and no more than 9 credits may be taken, overall, as a visiting or non-degree student. If a student is subsequently admitted to a degree program at the NYU Tandon School of Engineering, the courses taken while registered as a visiting or non-degree student are considered to have been taken in residence. Permission to take courses as a visiting or non-degree seeking student does not guarantee subsequent admission to a degree or certificate program. Students who have been denied admission to the NYU Tandon School of Engineering may not take (or continue to take) courses as a non-degree or visiting student.

For visiting and non-degree applications, GRE scores are not required and unofficial or official transcripts may be provided by the applicant. For students enrolled in a program at another institution, a letter from the student's adviser or department chair is sufficient to establish that they are in good standing. A copy of the transcript(s) must be appended to the visiting student registration form.

Readmission

Students who previously attended the NYU Tandon School of Engineering, who have not attended for one or more semesters, and who did not receive an approved leave of absence must apply for readmission after consultation with the Office of Graduate Academics.

Financial Aid

Undergraduate Financial Aid

Information regarding financial aid and scholarships at New York University is provided below:

- The Office of Financial Aid Online
- Applying for Financial Aid at NYU
- University Scholarships and Grants
- Loans
- Student Employment
- Tuition Remission
- Optional Payment Plans

Graduate Financial Aid

Graduate Scholarships

Graduate scholarships are available for master's students on a competitive basis. They are awarded at the time of admission and are primarily based on academic performance. All graduate scholarship recipients are required to maintain the academic terms listed in their award letter in order to continue scholarship awards past their first enrolled semester.

Students who are admitted to multiple graduate programs are eligible for only one offered scholarship; it is the policy of the NYU Tandon School of Engineering to not "stack" scholarship awards.

Research Fellowships

Doctoral students receiving research fellowships are assigned to research that fulfills the thesis requirement of the graduate curriculum in which they matriculate. They receive a living allowance and remitted tuition. Fellows must be registered as full-time students taking each semester nine or more credits, possibly including their thesis. Typically, funding comes from grants and contracts that faculty have secured from government agencies or industry. In these cases, the student's research is also reported to the funding agency or company as part of the grant or contract requirements.

William D. Ford Federal Direct Unsubsidized Loan

The Federal Direct Unsubsidized loan is available to graduate students in the amount of $20,500 per academic year. Eligible students must (1) be U.S. Citizens or permanent residents, (2) matriculate and enroll in at least 4.5 credits per semester, (3) make satisfactory academic progress and (4) demonstrate financial need as determined by the Free Application for Federal Student Aid (FAFSA).

To apply, students must complete a FAFSA each year. First time Direct Loan borrowers must also complete the Master Promissory Note and Entrance Counseling session (online).

Student borrowers who withdraw from the school or enroll less than half-time will be required to complete the Exit Counseling session (online). Borrowers must begin repaying the loan six months after graduating or withdrawing from school. Direct Lending offers many different repayment options, and deferments and forgiveness options are also available. Borrowers should contact Direct Lending regarding any of these options.

Graduate Federal Direct Plus Loan

PLUS loans are federal loans that Graduate students may use to help pay for college expenses. Graduate students whose full cost of attendance is not covered by the William D. Ford Unsubsidized Direct Loan may apply for the Graduate Direct PLUS loan. Students may apply for up to the full cost of attendance minus any financial aid. A FAFSA is required and the Unsubsidized Direct Loan must be accepted before applying for the PLUS loan. The loan is not guaranteed and is subject to credit approval. Repayment can be deferred until graduation or withdrawal from the University. Contact the NYU Office of Financial Aid or the Federal Student Aid website regarding interest rates and application process.

Bills, Payments and Refunds

The Office of the Bursar is the central billing and collection point for New York University. The department is responsible for managing the university billing, collecting, refunding and cashiering functions.

https://www.nyu.edu/students/student-information-and-resources/bills-payments-and-refunds.html

Administrative Offices

Academic Advisement Center

http://engineering.nyu.edu/academics/support/academic
Tel.: (646) 997-3980
Hours: Monday-Friday 9am-5pm

Alumni Relations

http://engineering.nyu.edu/alumni
Tel.: (646) 997-3885
Fax: (646) 997-3449
E-mail: engineering.alumni@nyu.edu
Hours: Monday-Friday, 9am-5pm

Athletics

http://gonyuathletics.com/index.aspx?path=baf
Tel.: (646) 997-3453
Fax: (646) 997-3473
Hours: Monday-Friday, 9am-5pm
GYMNASIUM/FITNESS CENTER
Hours: Monday-Friday, 7:30am-10pm;
Sat. & Sun., 9:30am-5pm

Bern Dibner Library of Science and Technology

https://library.nyu.edu/locations/bern-dibner-library/
Tel.: (646) 997-3530
Fax: (646) 997-3756
E-mail: dibner.library@nyu.edu
Hours: Monday-Friday, 8:30am-1am;
Sat.-Sun., 10am-11pm

Bursar

NYU Tandon Future Labs

http://engineering.nyu.edu/business/future-labs
137 Varick Street - 2nd Floor NY, NY 10013
Tel.: (212) 292-3123
Fax: (212) 206-9190
Email: hello@futurelabs.nyc

20 Jay Street - Suite 312 Brooklyn, NY 11201
Tel.: (718) 407-6561
Email: hello@futurelabs.nyc

15 MetroTech Center - 19th Floor Brooklyn, NY 11201
Tel.: (646) 997-3083
Email: info@ufl.nyc

87 35th St. - 2nd Floor Brooklyn, NY 11232
Email: hello@futurelabs.nyc

Hours: Monday - Friday 9am-5pm

Office of Global Services

http://nyu.edu/ogs
Tel.: (646) 997-3805
Fax: (646) 997-3710
E-mail: Online Form
Hours: Monday-Friday, 9am-5pm

Office of Sponsored Programs

https://engineering.nyu.edu/office-sponsored-programs
Tel.: (646) 997-3360
Fax: (646) 997-3063
Hours: Monday-Friday, 9am-5pm

http://www.nyu.edu/life/resources-and-services/nyu-studentlink/bills-payments-and-refunds.html
Tel.: (212) 998-2806
Fax: (212) 998-2817
E-mail: bursar.studentaccounts@nyu.edu
Hours: Monday, Tuesday, Friday, 9am -5pm;
Wednesday, Thursday, 9am-6pm

CATT/WICAT

https://engineering.nyu.edu/center-advanced-technology-telecommunications-catt
Tel.: (646) 997-3050
Fax: (646) 997-3074
E-mail: info@catt.poly.edu
Hours: Monday-Friday, 9am-5pm

Counseling and Psychological Services

https://www.nyu.edu/students/health-and-wellness/counseling-services.html
Tel: (646) 997-3456
Tel.: (646) 997-3537 (for emergencies)
Email: wellness.exchange@nyu.edu
Hours: Monday-Friday, 9am-5pm

Center for K-12 Stem Education

http://engineering.nyu.edu/k12stem
Tel.: (646) 997-3524
Fax: (646) 997-3733
E-mail: k12.stem@nyu.edu
Hours: Monday-Friday, 9am-5pm

Client Services Center

https://www.nyu.edu/fcm/workrequestform/
Tel: (212) 998-1001
Fax: (212) 995-4671
E-mail: contactcsc@nyu.edu
Hours: Monday-Friday, 6am-10pm
Sat. & Sun., 8am-8pm

Polytechnic Tutoring Center

http://engineering.nyu.edu/academics/support/polytechnic
Tel.: (646) 997-3425
E-mail: polytechnictutoring@nyu.edu
Hours: Monday-Friday, 10am-6pm;

Records + Registration

https://engineering.nyu.edu/academics/support-services/registration
Tel.: (646) 997-4123
Email: tandon.registration@nyu.edu
Hours: Monday-Friday, 9am-5pm

Registrar

https://www.nyu.edu/registrar/
Tel.: (212) 998-4800
Fax: (212) 995-4154
E-mail: Online Contact Form
Hours: Monday-Friday, 9am-5pm

Residence Life

http://www.nyu.edu/life/living-at-nyu.html
Tel.: (212) 998-4600
E-mail: housing@nyu.edu
Hours: Monday-Friday, 9am-5pm

Security

https://engineering.nyu.edu/campus-and-community/student-life/student-resources-and-services/public-safety
Dibner Building - Tel.: (646) 997-3727
RH Front Entrance - Tel.: (646) 997-3537
RH Rear Entrance - Tel.: (646) 997-3213
WH Entrance - Tel.: (718) 637-5901
2 MTC Entrance - Tel.: (646) 997-3922
15 MTC Entrance - Tel.: (718) 312-7777

Student Activities

Faculty Innovations in Teaching and Learning

https://engineering.nyu.edu/academics/support-services/faculty-innovation-fitl
Tel.: (646) 997-3625
E-mail: fitl@nyu.edu
Hours: Monday-Friday, 9am-5pm

Financial Aid

http://www.nyu.edu/admissions/financial-aid-and-scholarships.html
Tel.: (212) 998-4444
Fax: (212) 995-4661
E-mail: financial.aid@nyu.edu
Hours: Monday, Tuesday, Friday, 9am-5pm;
Wednesday, Thursday, 9am-6pm

Freshman Programs

Tel.: (646) 997-3391
E-mail: mparham@nyu.edu
Hours: Monday-Friday, 9am-5pm

General Studies (GS) Program

http://engineering.nyu.edu/academics/support/general-studies
Tel.: (646) 997-3882
E-mail: mbarnes@nyu.edu
Hours: Monday-Friday, 9am-5pm

Graduate Center

http://engineering.nyu.edu/admissions/graduate/
Tel.: (646) 997-3182
Fax: (646) 997-3426
E-mail: engineering.gradinfo@nyu.edu
Hours: Monday-Friday, 9am-5pm

Higher Education Opportunity Program (HEOP)

https://engineering.nyu.edu/academics/support-services/undergraduate-services/opportunity-programs

http://engineering.nyu.edu/life/studentactivities
Tel.: (646) 997-3800
Fax: (646) 997-3917
E-mail: nyuengrosarc@nyu.edu
Hours: Monday-Thursday, 9am-6pm; Friday, 9am-5pm

Student Affairs

https://engineering.nyu.edu/campus-and-community/student-life/office-student-affairs
Tel.: (646) 997-3918
Fax: (646) 997-3197
E-mail: eng.studentaffairs@nyu.edu
Hours: Monday-Friday, 9am-5pm

Student Advocacy

http://engineering.nyu.edu/life/student-affairs/advocacy-privacy-and-compliance
Tel.: (646) 997-3046
Fax: (646) 997-3197
E-mail: deanna.rayment@nyu.edu
Hours: Monday-Friday, 9am-5pm

TRIO Scholars Program

http://engineering.nyu.edu/trioscholars
Tel.: (646) 997-3560
Fax: (646) 997-3945
E-mail: trionyupoly@gmail.com
Hours: Monday-Friday, 9am-5pm

Undergraduate Academics

http://engineering.nyu.edu/academics
Tel.: (646) 997-3986
Fax: (646) 997-3896
E-mail: uga.engineering@nyu.edu
Hours: Monday-Friday, 9am-5pm

Undergraduate Admissions

https://engineering.nyu.edu/admissions/undergraduate-admissions
Tel.: (212) 998-4500

Tel.: (646) 997-3370
Fax: (646) 997-4135
E-mail: smbailey@nyu.edu, tlao@nyu.edu
Hours: Monday-Friday, 9am-5pm

Honors Program

http://engineering.nyu.edu/academics/honors
Tel.: (646) 997-3986
Fax: (646) 997-3896
E-mail: jennifer.piro@nyu.edu
Hours: Monday-Friday, 9am-5pm

Human Resources

http://engineering.nyu.edu/services/human-resources
Tel.: (646) 997-3840
Fax: (646) 997-3981
E-mail: soe-hr@nyu.edu
Hours: Monday-Friday, 9am-5pm

Information Systems

http://engineering.nyu.edu/services/information-technology-systems
Tel.: (646) 997-3123
E-mail: soehelpdesk@nyu.edu
Hours: Monday-Friday, 9am-5pm

Jasper H. Kane Dining Hall

https://nyu.campusdish.com/en/LocationsAndMenus/JasperKaneCafé
Tel.: (646) 997-3782
Fax: (718) 875-0509
E-mail: dining.services@nyu.edu
Hours: Monday-Thursday, 7:30am-9pm;
Friday, 7:30am-7pm, Sat.-Sun.,10am-7pm

Mail and Copy Center

https://engineering.nyu.edu/services/copy-and-mail-center
Tel.: (646) 997-3604
E-mail: mailservices@nyu.edu
Hours: Monday-Friday, 8am-5pm

E-mail: admissions@nyu.edu
Hours: Monday-Friday, 9am-5pm, Saturday, 10am-4pm, 10am-4pm April-October

Wasserman Center for Career Development | Brooklyn

https://www.nyu.edu/life/resources-and-services/career-development.html
Tel.: (646) 997-5986
E-mail: career.development@nyu.edu
Office Hours: Monday-Friday, 9am-5pm
Drop-in Hours: Monday-Thursday, 2:30pm-4pm; Friday 12pm-1:30pm

Web and Media Services

Tel.: (718) 260-3971
Fax: (718) 260-3756
E-mail: support@webteam.poly.edu
Hours: Monday-Friday, 9am-5pm

Communication Policy

In our continuing campaign to be environmentally aware by "going green" and to increase the safety, efficiency, and speed of our communication with students, NYU Tandon School of Engineering has instituted a communication policy in which it will no longer use paper communication with students.

All NYU Tandon students have an NYU e-mail account and, through the NYU Classes integration, access to NYU Home for institutional information concerning the classes for which they are registered and organizational information and services. Because of this robust electronic access, NYU faculty and administration will contact students with important information and notices electronically only through the various communication technologies and environments provided by the University.

To ensure that students both receive and are responsive to important notices from all departments and offices at the School, students need to observe the following policy:

- The NYU e-mail accounts are student's official point of contact. Students are expected to directly access this account at least once each school day. Visit https://www.nyu.edu/its/email/ for more information and assistance.
- Students must be aware of notices posted on their NYU Home Pages. It is the student's responsibility to check this portal during the drop/add period of registration and regularly during the term in order to verify the accuracy of his/her schedule and to read any official university notices. Schedules should be verified by students at least once during the first two weeks of the term and once after mid-semester via Albert.
- The university calendars that delineate the different registration periods are also available online on the Registrar's website. Students should be familiar with these calendars and adhere to the dates accordingly.
- Students are required to be aware of course-related information available on their course environment on NYU Classes, such as course syllabi, resources, calendar, assignment expectations, special announcements, grades etc.

School Compliance and Other Guidelines

School Compliance and Other Guidelines

Most issues of compliance are adjudicated through the Office of Community Standards. Please consult the following links: http://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/governance-legal.html. You will find a number of links, alcohol and drugs, for example, which you can then follow.

Please note than any issues of sexual misconduct have their own link: http://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/sexual-misconduct--relationship-violence--and-stalking-resource-.html. The contact person is Mary Signor: mary.signor@nyu.edu.

Academic misconduct is handled at the Tandon School of Engineering, and is usually initiated at the departmental level. Please check: http://engineering.nyu.edu/life/student-affairs/code-of-conduct. The contact person is Deanna Rayment: deanna.rayment@nyu.edu.

Family Educational Rights and Privacy Act (FERPA).

FERPA (Family Educational Rights and Privacy Act) is a federal law that protects the privacy of student educational records. It applies to all Schools receiving funds under an applicable program. FERPA rights transfer to a student when they are 18 years of age or they attend a school past high school. Students may choose to waive their FERPA protections by signing a waiver form in person at the Registrar's office.

Please consult: https://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/FERPA.html

Alcohol and Drugs

A detailed description of prohibitions in regards to the above is available at: https://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/university-student-conduct-policy.html

Health Insurance

All students must have medical insurance. Students with 9 or more credits are automatically enrolled; students with 1 or more credits may choose to enroll. If a student already has medical coverage, they will need to provide proof of their comparable coverage online.

Please consult: https://www.nyu.edu/students/health-and-wellness/student-health-insurance.html

Immunization

New York State law requires students to show proof of immunity to measles, mumps and rubella. NYU Tandon School of Engineering complies fully with the provisions of this law. The law applies to all students (graduate and undergraduate) born on or after January 1, 1957.

Immunization status is checked as part of registration for new students. New first-year, transfer and graduate students who fail to comply (1) are barred from attending class (and are not entitled to any tuition refund); (2) do not receive grades; and (3) are denied further registration.

Please consult: https://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/student-immunization-policy.html

Student Identification

All students are required to carry and maintain photo-identification cards at all times on and around the various NYU sites.

To get an NYU ID, please consult: https://www.nyu.edu/life/resources-and-services/nyu-card-and-campus-cash/get-an-nyucard.html

To report a lost card, please consult: https://www.nyu.edu/life/resources-and-services/nyu-card-and-campus-cash/get-an-nyucard/report-lost-card.html

Statistics on Enrollment and the Student Body

Enrollment 2019-2020

Fall 2019

Undergraduate			Graduate			Total
FT	PT	TOT	FT	PT	TOT	
2687	74	2761	2642	670	3312	6073

Student Body

Fall 2019

Undergraduate		Graduate	
Men	Women	Men	Women
1637	1124	2317	995

Persistence and Completion Information

As required by the New York State Education Department Higher Education Data System, the NYU Tandon School of Engineering conducts a yearly cohort survival analysis. This study collects data for a group or cohort of first-time, full-time first year (never attended college before) students who enter the School. The data measures retention patterns and indicates the time needed to complete undergraduate degrees at the NYU Tandon School of Engineering. For a cohort study of first-time full-time students who entered NYU Tandon as first year students in Fall 2013, 51 percent received their Bachelor of Science degree within four years, 67 percent graduated in five years and 70 percent completed their degree within six years.

Student Retention

First-time full-time undergraduate students continuing at the School, 2019-2020:

School-wide:	83%

Enrollment by Racial/Ethnic Status (Using standard federal classifications)

	Undergraduate Students	Graduate Students
Caucasian	15.14%	10.60%
Two or More Races	3.30%	1.09%

Not Applicable	6.30%	1.84%
Native Hawaiian/Oth Pac Island	0.11%	0.06%
International*	21.15%	73.49%
Hispanic	15.86%	3.65%
Black	7.14%	1.45%
Asian/Pacific Islander	30.93%	7.76%
American Indian/Alaskan Native	0.07%	0.06%

**International students come from more than 85 countries*

NYU Calendars

The Tandon School of Engineering follows the dates and deadlines put forth by the University Registrar. Please see below for links to the various calendars and schedules which contain detailed dates and information.

Academic Calendar

Registration Calendar

Global Academic Center Calendar

Withdrawal Schedule

Refund Schedule

Graduation Deadlines

Academic Department, Degree and Program Information

Learn about NYU-Poly's academic departments and their missions and explore departmental offerings.

New York University Tandon School of Engineering

Non-Degree

Robotics Interdisciplinary Minor

Minor in Robotics

The Minor in Robotics provides students with a foundation in the fundamental areas of the interdisciplinary field of robotics. Together with a degree in engineering or computer science, the Minor in Robotics prepares students for careers and graduate studies in robotics. Students may obtain a Minor in Robotics by taking the following courses.

ROB-UY 2004 Robotic Manipulation and Locomotion
ROB-UY 3203 Robot Vision
ROB-UY 3303 Robot Motion and Planning
ROB-UY 3404 Haptics and Telerobotics in Medicine

In order for the Minor to be awarded and recorded on the official student transcript, the student must obtain an overall 2.00 GPA in the Minor courses.

Prerequisites

The courses for the Minor in Robotics have the following prerequisites in computer science, mathematics, and physics.

1) Computer Science - Introduction to Programming
2) Mathematics - Differential Equations and Linear Algebra
3) Physics - Mechanics

Students at NYU Tandon and other schools of NYU who meet the prerequisites may enroll in ROB-UY courses. Various courses across NYU schools and NYU global campuses satisfy these prerequisites, as follows.

1) The Computer Science prerequisite is satisfied by any of the following: CS-UY 1114 or CS-UY 1113 or CS-UY 1133 or ENGR-UH 1000 or CS-UH 1001 or CSCI-SHU 11 or CSCI-SHU 101.

2) The Mathematics prerequisites is satisfied by a single course covering linear algebra and differential equations: MA-UY 2034 or MATH-SHU 265

or by separate courses in linear algebra:
MA-UY 3034 or MATH-UA 140 or MATH-UH 1022 or MATH-SHU 140

and differential equations:
MA-UY 4204 or MATH-UA 262 or MATH-UH 1024 or MATH-SHU 262

3) The Physics prerequisite is satisfied by any of the following: PH-UY 1013 or PHYS-UA 11 or PHYS-UA 91 or ENGR-UH 2012 or PHYS-SHU 11 or PHYS-SHU 91

Notes

'UH' designates courses offered at NYU-Abu Dhabi
'SHU' designates courses offered at NYU-Shanghai

Contact Information

Students with questions about the Minor in Robotics can contact an Undergraduate Academic Advisor in either the Department of Electrical and Computer Engineering (ECE) or the Department of Mechanical and Aerospace Engineering (MAE).

Department of Applied Physics

Chair: John Di Bartolo

Mission Statement

The NYU Tandon School of Engineering Department of Applied Physics is committed to providing high-quality introductory-, intermediate- and advanced-level physics courses as services to the School's engineering and science departments. The major programs train new generations of physicists who apply the tools of physics to contemporary problems to benefit all. The department, collaborating closely with other departments, employs physics knowledge and techniques to enable engineering research and education, and serve as a catalyst for research in other scientific fields.

Physics: The Fundamental Science

Physics is the science devoted to the study and understanding of nature. It traces its history back to Aristotle and derives its name from the Greek words for nature and natural. Physics is often said to be the most fundamental science which deals with the constituents, properties and evolution of the entire universe, on all length and time scales. Applied Physics is the branch of physics where the implications and uses of fundamental physics knowledge are explored and exploited.

Contact Information

NYU Tandon School of Engineering
Six MetroTech Center
Brooklyn, NY 11201
Tel: (646) 997-3072
Fax: (646) 997-3139
E-mail: appliedphysics@nyu.edu
Web: http://engineering.nyu.edu/academics/departments/physics

Degrees Offered

The department offers Applied Physics, B.S. and Applied Physics, M.S. degrees, and a dual major degree in Mathematics and Physics, administered in cooperation with the Department of Mathematics. Students may elect to take a minor in Applied Physics or elect a Nuclear Sciences and Engineering Concentration or a Nuclear Sciences and Engineering Minor, administered in cooperation with the Department of Mechanical Engineering. Read more about the Applied Physics Program.

Faculty

Professors

Stephen Arnold, University and Thomas Potts Professor
PhD, City University of New York
Microparticle Photophysics, Whispering Gallery Mode Biosensing, Organic Molecular Crystals

Kurt H. Becker, Professor Dr. rer. net., Universität des Saarlandes, Saarbrücken, Germany
Atomic, Molecular, and Chemical Physics; Plasma Physics; Development of New Experimental Techniques and Processes

Associate Professor

Lorcan M. Folan, Associate Professor, Department Chair
PhD, Polytechnic University
Spectroscopic characterization of aerosol particles; optical properties of micro-cavities; energy transfer in condensed matter; electron capture beta decay

Industry Professors

Victor Y. Barinov, Industry Associate Professor
PhD, Academy of Science of the Ukraine

Valery A. Sheverev, Industry Professor, Director of Physics Laboratory Program
PhD, Leningrad State University

Vladimir I. Tsifrinovich, Industry Professor
DSc, Kirensky Institute of Physics, Academy of Science, USSR

Lecturers

S. John DiBartolo, Senior Lecturer
PhD, University of Virginia

David T. Mugglin, Senior Lecturer
PhD, Lehigh University

Vladimir Ostrovsky, Senior Lecturer
DSc, Kiev Institute of Physics, Academy of Science, USSR

Adjunct Faculty

Partha P. Debroy, Adjunct Professor
Ph.D. Carnegie Mellon University

Olga Dulub, Adjunct Professor
PhD, Tulane University

Peter M. Fried, Adjunct Professor
Ph.D. University of Wisconsin, Madison

Akhil Lal, Adjunct Professor
PhD, Polytechnic University

Benjamin Nachumi, Adjunct Professor
PhD, Columbia University

Vladimir Petricevic, Adjunct Professor
PhD, City University of New York

Alexander Raspopin, Adjunct Professor
Ph.D. Stevens Institute of Technology

Siyka I Shopova, Adjunct Professor
PhD, Oklahoma State University

Emeritus Faculty

Deo C. Choudhury, Professor Emeritus
PhD, University of California

Hellmut J. Juretschke, Professor Emeritus
PhD, Harvard University

Edward L. Wolf, Professor Emeritus
PhD, Cornell University

Applied Physics

Undergraduate and Graduate Adviser: John Di Bartolo

Physics is the basic science of the natural world, the study of matter, energy and motion. Worthy of study for its own beauty, physics is also the foundation of engineering and the natural sciences.

Goals and Objectives

The mission of the Applied Physics Program is to provide undergraduates at the NYU Tandon School of Engineering with a strong foundation in physics, suited to the discipline, and to offer advanced opportunities for formal study in physics.

Non-Degree

Applied Physics Minor

The Applied Physics Department offers a Minor in Applied Physics which consists of a set of 4 or more physics courses totaling at least 15 credits. The courses should be at the intermediate or advanced level (i.e. any course listed after PH-UY 2033) and have the introductory physics sequence* as prerequisites. You must also earn an overall GPA of 2.0 in these courses to receive the minor. Transfer students must earn at least 8 credits with a 2.0 GPA at the School of Engineering.

*PH-UY 1013, PH-UY 2023, PH-UY 2033, PH-UY 2121, and PH-UY 2131.

Contact Information:

Departmental Adviser: Lorcan Folan

folan@nyu.edu

Nuclear Sciences and Engineering Concentration

Concentration and Minor in Nuclear Science and Engineering

This interdisciplinary program aims to produce engineering and science graduates who understand clearly the benefits and risks of nuclear technologies and who will seriously consider employment in nuclear industry and government.

Students may obtain an Interdisciplinary Concentration or Minor in Nuclear Science and Engineering, in conjunction with a traditional degree. Those majors include civil, chemical and biological, computer, electrical, financial and risk, or mechanical engineering, or the physical or computational sciences (all are majors currently offered by the NYU Tandon School of Engineering).

Concentration in Nuclear Science and Engineering

The concentration consists of three courses taken typically during the junior and senior years. Students can use the available technical and free electives in their curriculum to take these courses.

- PH-UY 3103 Fundamentals of Applied Nuclear Physics *3 Credits*
- PH-UY 3503 Introduction to Radiation Physics and Dosimetry *3 Credits*
- ME-UY 4373 Introduction to Nuclear Engineering *3 Credits*

Nuclear Sciences and Engineering Minor

Concentration and Minor in Nuclear Science and Engineering

This interdisciplinary program aims to produce engineering and science graduates who understand clearly the benefits and risks of nuclear technologies and who will seriously consider employment in nuclear industry and government.

Students may obtain an Interdisciplinary Concentration or Minor in Nuclear Science and Engineering, in conjunction with a traditional degree. Those majors include civil, chemical and biological, computer, electrical, financial and risk, or mechanical engineering, or the physical or computational sciences (all are majors currently offered by the NYU Tandon School of Engineering).

Minor in Nuclear Science and Engineering

The core of the minor is the three course concentration.

- PH-UY 3103 Fundamentals of Applied Nuclear Physics *3 Credits*
- PH-UY 3503 Introduction to Radiation Physics and Dosimetry *3 Credits*
- ME-UY 4373 Introduction to Nuclear Engineering *3 Credits*

Electives

The balance of the 15 credits required for the minor shall be selected from the approved elective courses listed below.

Approved elective courses include:

- ECE-UY 2613 Fundamentals of Electric Power Engineering for Non EE Students *3 Credits*
- PS-UY 2724 Human Factors in Engineering Design *4 Credits*
- PH-UY 3513 Nuclear and Radiation Instrumentation and Methods *3 Credits*
- RSK-UY 3593 Probabilistic Risk Assessment *3 Credits*
- ME-UY 4393 Nuclear Power Plant Systems *3 Credits*
- ME-UY 4863 Corrosion and Non-Destructive Evaluation of Materials *3 Credits*

Note:

An overall GPA of 2.0 is required in the courses to earn the minor.

Contact Information:

Departmental Adviser: Lorcan Folan

folan@nyu.edu

Bachelor of Science

Applied Physics, B.S.

Bachelor of Science in Applied Physics

Students must complete 128 credits, as defined below, to graduate from the School of Engineering with a Bachelor of Science in Applied Physics. Please note that the curriculum that follows applies to students who began classes in the fall of 2020 or later. If students entered the School of Engineering prior to that date, please consult the curriculum and typical course schedule for students entering spring 2020 or earlier.

The Department of Applied Physics also offers a Minor in Applied Physics and a Concentration and a Minor in Nuclear Science and Engineering. A full list of the department's course offerings is available on the departmental website.

Core Physics Requirements: 36 Credits

- PH-UY 1002 Physics: The Genesis of Technology *2 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*

- PH-UY 2104 Analytical Mechanics *4 Credits*
- PH-UY 2344 Introduction to Modern and Solid State Physics *4 Credits*
- PH-UY 3002 Junior Physics Laboratory *2 Credits*
- PH-UY 3234 Electricity and Magnetism *4 Credits*
- PH-UY 4124 Thermodynamics and Statistical Physics *4 Credits*
- PH-GY 6673 Quantum Mechanics I *3 Credits*
- PH-UY 4912 Senior Seminar in Physics *2 Credits*

Other Required Courses: 37 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*
- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- MA-UY 2224 Data Analysis *4 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
  or
- CM-UY 1014 General Chemistry I *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*

Physics and Math Electives: 21 Credits

Students should select 5 physics elective courses totaling at least 17 Credits, and a 4 credit math elective.

Electives in the Humanities and Social Sciences: 16 Credits

Students must take 16 elective credits in the humanities and social sciences, preferably with EXPOS-UA 2 as a prerequisite. To gain some breadth and depth of knowledge, it is required that students take courses in at least two disciplines and at least one course at an advanced level.

STEM & Free Electives, Project and Independant Study: 18 Credits

Students should take 18 credits of independent study, STEM and free electives. It is strongly recommended that students use 6 of these credits toward a senior project or thesis topic. The program adviser must approve electives selected from other disciplines.

Typical Course Schedule - Applied Physics, BS

Freshman Year

Fall Semester: 15 Credits

- PH-UY 1002 Physics: The Genesis of Technology *2 Credits*

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
  or
- CM-UY 1014 General Chemistry I *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*

Spring Semester: 15 Credits

- PH-UY 1013 Mechanics *3 Credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Sophomore Year

Fall Semester: 16 Credits

- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- MA-UY 2224 Data Analysis *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Spring Semester: 16 Credits

- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- PH-UY 2344 Introduction to Modern and Solid State Physics *4 Credits*
- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Junior Year

Fall Semester: 16 Credits

- PH-UY 2104 Analytical Mechanics *4 Credits*
- Physics Elective *4 Credits*
- Math Elective *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Spring Semester: 16 Credits

- PH-UY 3002 Junior Physics Laboratory *2 Credits*
- PH-UY 3234 Electricity and Magnetism *4 Credits*
- Physics Elective *3 Credits*

- STEM Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Senior Year

Fall Semester: 17 Credits

- PH-GY 6673 Quantum Mechanics I *3 Credits*
- PH-UY 4902 Introduction to Senior Project in Physics *2 Credits*
- PH-UY 4912 Senior Seminar in Physics *2 Credits*
- Physics Elective *4 Credits*
- STEM Elective *3 Credits*
- Free Elective *3 Credits*

Spring Semester: 17 Credits

- PH-UY 4124 Thermodynamics and Statistical Physics *4 Credits*
- PH-UY 4904 Senior Project in Physics *4 Credits*
- Physics Elective *3 Credits*
- Physics Elective *3 Credits*
- Free Elective *3 Credits*

Total Credits Required for the Degree: 128

Physics and Mathematics, B.S.

Dual Major in Physics and Mathematics

Students must complete 128 credits, as defined below, to graduate from the School of Engineering with a Bachelor of Science in Mathematics & Physics. Please note that the curriculum that follows applies to students who began classes in the **fall of 2020** or later. If you entered the School of Engineering prior to that date, please consult the curriculum and typical course schedule for students entering spring 2020 or earlier.

The Department of Applied Physics also offers a Minor in Applied Physics and a Concentration and Minor in Nuclear Science and Engineering. A full list of the department's undergraduate offerings is also available.

The core of the program is 32 credits of required physics courses and 31 credits of required math courses. Students pursuing the dual major must also take an additional 8 credits of physics and math electives. 22 credits are reserved for STEM & free electives and independent study courses. The remaining credits are used to satisfy other school, university and state requirements. The curriculum is specified in detail below.

Physics Requirements: 32 Credits

- PH-UY 1013 Mechanics *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*

- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2104 Analytical Mechanics *4 Credits*
- PH-UY 2344 Introduction to Modern and Solid State Physics *4 Credits*
- PH-UY 3002 Junior Physics Laboratory *2 Credits*
- PH-UY 3234 Electricity and Magnetism *4 Credits*
- PH-UY 4124 Thermodynamics and Statistical Physics *4 Credits*
- PH-GY 6673 Quantum Mechanics I *3 Credits*

Math Requirements: 31 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*
- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
  or MA-UY 2514 Honors Calculus III *4 Credits*
- MA-UY 2224 Data Analysis *4 Credits*
- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- MA-UY 3113 Advanced Linear Algebra and Complex Variables *3 Credits*
- MA-UY 4414 Applied Partial Differential Equations *4 Credits*
- MA-UY 4424 Numerical Analysis *4 Credits*

Other Required Courses: 19 Credits

- PH-UY 1002 Physics: The Genesis of Technology *2 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
  or CM-UY 1014 General Chemistry I *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*

Electives in the Humanities and Social Sciences: 16 Credits

Students are required to take 16 credits in the humanities and social sciences requiring EXPOS-UA 1 and EXPOS-UA 2 as prerequisites. To gain some breadth and depth of knowledge, it is required that you take courses in at least two disciplines and at least one course at an advanced level.

Math and Physics Electives: 8 Credits

Select at least 8 credits from the lists of undergraduate math and physics elective courses. Graduate courses may be substituted with advisor's approval.

- PH-UY 2813 Astronomy and Astrophysics *3 Credits*
- PH-UY 2823 Introduction to Geophysics *3 Credits*
- PH-UY 3054 Introduction to Polymer Physics *4 Credits*
- PH-UY 3103 Fundamentals of Applied Nuclear Physics *3 Credits*
- PH-UY 3474 Introduction to Modern Optics *4 Credits*
- PH-UY 3503 Introduction to Radiation Physics and Dosimetry *3 Credits*

- PH-UY 3513 Nuclear and Radiation Instrumentation and Methods *3 Credits*
- PH-UY 3603 Mathematical Physics *3 Credits*
- PH-UY 3614 Computational Physics *4 Credits*
- PH-UY 3703 Mathematical Physics II *3 Credits*
- PH-UY 4554 Solid State Physics *4 Credits*
- PH-UY 4603 Special Topics in Physics *3 Credits*

STEM and Free Electives, Independent Study and Projects: 22 Credits

22 credits are allocated for STEM & free electives and independent study courses. 8 credits are reserved for a 6 credit physics project plus a 2 credit senior physics seminar course or a 4 credit math project/thesis and an extra 4 credit math elective. The remaining 14 credits are reserved for two 4 credit STEM electives and two 3 credit free electives. The program adviser must approve electives selected from other disciplines.

Typical Course of Study for the Bachelor of Science in Physics & Mathematics

Freshman Year

Fall Semester: 15 Credits

- PH-UY 1002 Physics: The Genesis of Technology *2 Credits*
- MA-UY 1024 Calculus I for Engineers *4 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
  or CM-UY 1014 General Chemistry I *4 Credits*
- CM-UY 1014 General Chemistry I *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*

Spring Semester: 15 Credits

- PH-UY 1013 Mechanics *3 Credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Sophomore Year

Fall Semester: 16 Credits

- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- MA-UY 2224 Data Analysis *4 Credits*
- Humanities and Social Science Elective *4 Credits*

Spring Semester: 16 Credits

- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- PH-UY 2344 Introduction to Modern and Solid State Physics *4 Credits*
- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- Humanities and Social Science Elective *4 Credits*

Junior Year

Fall Semester: 16 Credits

- PH-UY 2104 Analytical Mechanics *4 Credits*
- MA-UY 4414 Applied Partial Differential Equations *4 Credits*
- STEM Elective *4 Credits*
- Humanities and Social Science Elective *4 Credits*

Spring Semester: 17 Credits

- PH-UY 3234 Electricity and Magnetism *4 Credits*
- PH-UY 3002 Junior Physics Laboratory *2 Credits*
- MA-UY 4424 Numerical Analysis *4 Credits*
- STEM Elective *4 Credits*
- Free Elective 3 *Credits*

Senior Year

Fall Semester: 17 Credits

- PH-GY 6673 Quantum Mechanics I *3 Credits*
- PH-UY 4902 Introduction to Senior Project in Physics *2 Credits*
  or Math Elective *2 Credits*
- PH-UY 4912 Senior Seminar in Physics *2 Credits*
  or Math Elective *2 Credits*
- MA-UY 3113 Advanced Linear Algebra and Complex Variables *3 Credits*
- Humanities and Social Science Elective *4 Credits*
- Free Elective *3 Credits*

Spring Semester: 16 Credits

- PH-UY 4904 Senior Project in Physics *4 Credits*
  or MA-UY 4924 Math Independent Study *4 Credits*
- PH-UY 4124 Thermodynamics and Statistical Physics *4 Credits*
- Math Elective *4 Credits*
- Physics Elective *4 Credits*

Total Credits Required for the Degree: 128

Master of Science

Applied Physics, M.S.

Master of Science in Applied Physics

Admitted students will be expected to have a BS in physics, applied physics, or a closely-related discipline and to make up any deficiencies before commencing graduate studies. Letters of recommendation, undergraduate GPA, GRE and TOEFL scores, and application letters will be considered in the admission process.

Degree Requirements

Completion of the Master of Science in Applied Physics requires a minimum of 30 semester credits. Students are required to take 6 credits of basic core courses (a 3-credit course in quantum mechanics and two semesters of graduate seminar) with the balance of the necessary credits earned in elective courses. The elective courses may include a 6-credit research project or a 9-credit thesis in applied physics. Up to 9 credits of Tandon engineering, science or computer science courses may also be used as electives in the program. Choice of a project or thesis option and of elective courses should be made with the approval of the graduate adviser. As many as 9 transfer credits of physics courses taken outside NYU, or up to 3 suitable courses from the Graduate School of Arts and Sciences may be accepted towards the degree, with the approval of the graduate adviser. No comprehensive examination is required for the master's degree in applied physics.

Minimum Core Course Requirements

- PH-GY 6673 Quantum Mechanics I *3 Credits*
- PH-GY 9531 Graduate Seminar in Physics I *1.5 Credits*
- PH-GY 9541 Graduate Seminar in Physics II *1.5 Credits*

Elective Courses: 24 Credits

Of the elective courses, up to 4 will be allowed at the 5000 level. Suitable applied physics elective courses include:

- PH-GY 5343 Physical Basis of Nanotechnology *3 Credits*
- PH-GY 5443 Physical Techniques and Applications of Nanotechnology *3 Credits*
- PH-GY 5473 Modern Optics *3 Credits*
- PH-GY 5493 Physics of Nanoelectronics *3 Credits*
- PH-GY 5553 Physics of Quantum Computing *3 Credits*
- PH-GY 5663 Physics of Alternative Energy *3 Credits*
- PH-GY 6403 Physical Concepts of Polymer Nanocomposites *3 Credits*
- PH-GY 6513 Introduction to Solid-State Physics I *3 Credits*
- PH-GY 6523 Introduction to Solid-State Physics II *3 Credits*
- PH-GY 6553 Advanced Quantum Computing *3 Credits*

- PH-GY 6683 Quantum Mechanics II *3 Credits*
- PH-GY 8013 Selected Topics in Advanced Physics *3 Credits*
- PH-GY 8023 Selected Topics in Advanced Physics *3 Credits*
- PH-GY 955X Readings in Applied Physics *1-4 Credits*
- PH-GY 996X MS Project in Applied Physics *1-9 Credits*
- PH-GY 997X MS Thesis in Applied Physics *3 Credits*

Total Credits Required: 30

Department of Biomedical Engineering

Chair: Andreas Hielscher

Mission Statement

The overall mission of the Biomedical Engineering Department is to prepare our students for careers that leverage a deep foundation in engineering and technology in order to discover, design, and develop new engineering products, systems and processes to improve human health and wellness.

The Department

The newly established Department of Biomedical Engineering has assembled a core of renowned faculty from multiple disciplines in the NYU Tandon School of Engineering and the NYU School of Medicine. Biomedical Engineering is inherently multidisciplinary, and the new department reflects that breadth in its faculty, educational programs, and research.

The department currently offers the MS and PhD degrees in Biomedical Engineering. The PhD program is not currently accepting students. Our graduate programs include courses in areas such as human anatomy and physiology, applied math, medical imaging, digital signal processing, tissue engineering, and biomedical instrumentation, with a choice of specialized tracks in Biomaterials, Medical Imaging and Bioinstrumentation. Students are encouraged to engage in engineering research projects in collaboration with medical researchers and clinicians, on problems of immediate importance and application.

Our faculty and students focus on connecting engineering and technology with medicine. They create new approaches and tools for medical imaging, tissue engineering and repair, bioinstrumentation and biosensors, mechanobiology, robotics and prosthetics, computational medicine, systems genetics, and a wide variety of other applications. For example, our biomedical engineers have multiple joint projects involving researchers from the Orthopaedic Surgery Department, for novel cartilage and bone repair biotherapeutics and joint implants. We are working with our counterparts in radiology and radiation oncology on new signal processing and data management protocols for medical imaging and radiotherapy. We work with neurologists on devices and analysis approaches for on-site detection of mild traumatic brain injuries. Our faculty are collaborating with physicians working in cardiovascular medicine on the development of new stent delivery devices, and with faculty in rehabilitation medicine on recovery and enhancement of physical abilities. These and other project areas are supported by our strengths in medical imaging, signal processing and analysis, wireless devices, big data management and visualization, novel detection phenomena and diagnostic devices, controlled biomolecular structure and interactions, and computational modeling of complex systems. Our department faculty, staff, and students are knowledge brokers, inventors, innovators, entrepreneurs, and partners with companies engaged in healthcare technologies and therapeutics.

Our faculty and research laboratories are located in both our downtown Brooklyn campus, and at our First Avenue labs in Manhattan adjacent to the NYU Medical, Dental, and Nursing schools. Our biomedical engineering faculty have close connections with the physicians, faculty, researchers, and patients at NYU Langone Health and other nearby institutions of the Health Corridor, while maintaining teaching and research appointments in the Tandon School of Engineering. The Biomedical Engineering Department serves as a central point of coordination between health professionals and engineers, linking new enabling technologies with the real world needs of our communities in NYC and across our NYU Global Network locations.

Contact

NYU Tandon School of Engineering

Biomedical Engineering Department

433 First Avenue, room 904

New York, NY 10010

Tel: (212) 992-5970

Web: https://engineering.nyu.edu/academics/departments/biomedical-engineering

Email: engineering-bme@nyu.edu

Degrees Offered

Master of Science

- Biomedical Engineering, Biomaterials Track, M.S.
- Biomedical Engineering, Medical Imaging Track, M.S.
- Biomedical Engineering, Bioinstrumentation Track, M.S.

Doctor of Philosophy

- Biomedical Engineering (not currently accepting students)

FACULTY

Professors

Jef Boeke, PhD, DSc

Professor of Biochemistry & Molecular Pharmacology, and Biomedical Engineering

Director of the Institute of Systems Genetics

Member NAS, AAA&S

Mary K. Cowman, PhD

Professor of Biomedical Engineering, and Orthopaedic Surgery

Associate Dean for Bioengineering

Thorsten Kirsch, PhD

Professor of Orthopaedic Surgery, Cell Biology, and Biomedical Engineering

Vice Chair for Research, Orthopaedic Surgery

Director, Musculoskeletal Research Center

Joel S. Schuman, MD, FACS

Professor of Ophthalmology, Neuroscience & Physiology, Neural Science, Biomedical Engineering, and Electrical & Computer Engineering

Chair, Ophthalmology

Director, NYU Langone Eye Center

Ivan Selesnick, PhD

Professor of Electrical & Computer Engineering, Biomedical Engineering, and Radiology

Chair, Electrical & Computer Engineering

Daniel Sodickson, MD, PhD

Professor of Radiology, Neuroscience & Physiology, and Biomedical Engineering

Vice Chair for Research, Radiology

Director of the Bernard and Irene Schwartz Center for Biomedical Imaging

Principal Investigator of the Center for Advanced Imaging Innovation and Research

Co-director, Tech4Health

Samir Taneja, MD

Professor of Urology, Radiology, and Biomedical Engineering

Vice Chair, Urology

Director, Division of Urologic Oncology

GU Program Director, Perlmutter Cancer Center

Yao Wang, PhD

Professor of Electrical & Computer Engineering, Biomedical Engineering, and Radiology

Assistant Professors

Alesha B. Castillo, PhD

Assistant Professor of Biomedical Engineering, and Orthopaedic Surgery

Weiqiang Chen, PhD

Assistant Professor of Biomedical Engineering, and Mechanical & Aerospace Engineering

John-Ross Rizzo, MD

Assistant Professor of Rehabilitation Medicine, Neurology, Mechanical & Aerospace Engineering, and Biomedical Engineering

Director, Visuomotor Integration Laboratory

Director, Rehabilitation Engineering Alliance and Center Transforming Low Vision

Industry Faculty

Gene R. DiResta, PhD, PE, DABR

Industry Professor of Biomedical Engineering

Biomedical Engineering

Academic Director: Andreas Hielscher

Goals and Objectives

The goal of the MS in Biomedical Engineering program is to give students an in-depth, advanced education that provides them with the analytical tools to perform fundamental and applied research in biomedical engineering. Alternatively, students gain the requisite technical knowledge to apply to management, marketing, sales and other entrepreneurial activities related to biomedical engineering. Specific objectives include the following:

- Enrolling students who come from many disciplines and bring different skill sets to solve a broad range of biomedical engineering problems. The program accommodates students with a BS or a more advanced degree in biomedical engineering, chemical engineering, mechanical engineering, electrical engineering, computer science, computer engineering, physics, chemistry, or biology.
- Providing students with a cutting-edge program that integrates quantitative-engineering skills with biological and medical sciences. Students acquire the skills to engage in technological innovations that give people longer, healthier and more productive lives.
- Merging the coursework, leadership and talents found at NYU Tandon's engineering departments with research opportunities with biomedical engineering faculty across NYU.

- Giving students an opportunity to focus on a wide range of contemporary topics critical to biomedical engineering. Students choose courses in topics that include biomedical instrumentation, biomaterials, drug delivery, orthopaedic biomechanics and devices, protein engineering, anatomy and physiology, biochemistry, immunology, bioinformatics, systems analysis and mathematics, medical imaging and material science.

In the years ahead, health and human productivity can be improved vastly through major advances in medicine. The successful, seamless integration of biology and modern engineering will drive those advances. Scientists anticipate future breakthroughs ranging from the design of drugs customized to an individual's genome to the perfection of artificial implantable organs. Aggressive and intelligent integration of engineering with the biological and medical sciences will hasten the realization of these and other innovations, leading to longer, healthier and more productive lives. Scientists now can visualize internal structures with a level of clarity thought impossible only a decade ago. With the improved diagnosis that comes from these advances and those that follow, science will discover further treatments.

Today, miniature devices can be manipulated through endoscopes, making it possible to perform minimally invasive surgery that reduces patient trauma. In the future, the micro-fabrication of biomedical devices at Tandon and elsewhere will enhance surgical technology and increase the functionality and quality of life of the physically-impaired in applications ranging from congenital defects to improving major organ function (heart, kidneys and liver). Other areas show similar promise. Breakthroughs in human tissue research point to the possibilities of replacing damaged or diseased bone, cartilage and other tissues with newly engineered materials. Bioresorbable materials will substitute for permanent implants to allow tissue recovery followed by clearance of the degraded implant material. New imaging modalities are emerging that provide advanced information and monitoring capabilities. Wireless technology will integrate medical devices and home-care systems with primary healthcare providers, and facilitate the storage and retrieval of patient data. Over the coming decades, these and other extraordinary developments will dramatically affect lives.

By merging NYU Tandon's leadership and talents in its programs in engineering, chemistry, biology, computer science, management and humanities programs with NYU's expertise in medical sciences, the NYU Tandon Biomedical Engineering Program provides students with a broad range of research opportunities. The collaboration between NYU Tandon and NYU School of Medicine is leading to a new model of biomedical education and to developing students with practical and fundamental knowledge. Students move freely among the institutions, taking advantage of faculty and associated research programs. NYU Tandon's goal is to provide the best in-classroom and laboratory education to develop the skills to succeed in a wide range of opportunities after graduation.

Full- and Part-time Students

Students entering this master's program may wish to complete their degree rapidly by taking a full course load, or proceed at a slower pace if they are working professionals who have other full- or part-time commitments. The curriculum structure and class schedule accommodates part-time and full-time students. Thus, most 3-credit courses are given as two-and-a-half hour lectures one evening a week during a 15-week semester. Research opportunities are available to all interested students.

Admission and Degree Requirements

The Master of Science degree is for students from various backgrounds seeking the in-depth knowledge and quantitative skills required for biomedical engineering. Students may apply to the master's program if they have one or more of the following: (1) BS or a more advanced degree in any engineering discipline, (2) BS or more advanced degree in mathematics or computer science or (3) BS or more advanced degree in any of the natural sciences. Entering students should have a minimum of two semesters of college-level calculus (see NYU Tandon course descriptions for mathematics courses MA-UY 1024 and MA-UY 1124); and two semesters of calculus-based physics (see NYU Tandon course descriptions for physics courses PH-UY 1013, PH-UY 2023, and PH-UY 2033). It is also highly recommended that each student's undergraduate preparation include two semesters of college-level chemistry (see NYU Tandon course descriptions for Chemistry, CM-UY 1014 and CM-UY 1024), one semester of linear algebra, one semester of ordinary differential equations, one semester of multivariable calculus, and two semesters of biology with labs. For students focusing on the **Biomaterials** track, additional background in organic chemistry and biochemistry is desirable. For those choosing the **Medical Imaging** or **Bioinstrumentation** tracks, additional advanced mathematics courses (e.g., complex variables, partial differential equations) are recommended. Though not required, exposure to CAD/FEA, Matlab, and C++/Python computer programming is highly desirable.

For International Students:

Applications can only be considered from international students who have completed all of the undergraduate math and science courses listed above.

For Domestic Students:

Applicants pursuing a career change and lacking some of the undergraduate courses listed above may be admitted conditionally if they present a strong record of achievement in their undergraduate field of study and agree to enroll in the missing undergraduate courses to raise their level of knowledge so that they are better prepared for the analytically rigorous course work that is part of the BME MS program. Such undergraduate courses do not count toward the MS degree's credit requirements.

Programs

Master of Science

- Biomedical Engineering, Biomaterials Track, M.S.
- Biomedical Engineering, Medical Imaging Track, M.S.
- Biomedical Engineering, Bioinstrumentation Track, M.S.

Doctor of Philosophy

- Biomedical Engineering (not currently accepting students)

Master of Science

Biomedical Engineering, Bioinstrumentation Track, M.S.

The Curriculum

Requirements for the Master of Science

Each track within the BME MS program includes two options. The first specifies course requirements that include research with submission of a master's thesis. The second option specifies course requirements plus research performed as guided studies. Students who choose the master's thesis option must register for 6 credits of BE-GY 997x and then write and defend a master's thesis according to School guidelines. Those students electing the thesis option will also be required to take training in laboratory safety.

Biomedical Engineering-Bioinstrumentation Track

To meet graduation requirements, students must achieve an overall B average in all courses (including MS thesis, research or guided studies) and must not have more than two grades of C in required (core) subjects.

Listed below are required (core) courses for students in the **Bioinstrumentation** track that fulfill the requirements for an MS in Biomedical Engineering.

Required Courses:

- BE-GY 6103 Anatomy, Physiology and Biophysics I *3 Credits*
- BE-GY 6113 Anatomy, Physiology and Biophysics II *3 Credits*
- BE-GY 6303 Bio-optics *3 Credits*
- BE-GY 6503 Bioinstrumentation *3 Credits*
- BE-GY 6403 Digital Signal Processing I *3 Credits*
  Or ECE-GY 6113 Digital Signal Processing I I 3 Credits
- BE-GY 6453 Probability and Stochastic Processes *3 Credits*
  Or ECE-GY 6303 Probability and Stochastic Processes | 3 Credits
- CBE-GY 6153 Applied Mathematics in Engineering *3 Credits*
- BE-GY 9730 Colloquium in Biomedical Engineering *0 Credits*
- BE-GY 9740 Seminar in Biomedical Engineering *0 Credits*

Electives

- You may choose up to 9 credits from the list of electives below, subject to the Research option chosen.

Research Options

- BE-GY 871x Guided Studies in Biomedical Engineering *3-6 Credits, each 3 Credits*
- BE-GY 997x MS Thesis in Biomedical Engineering *6-9 Credits, each 3 Credits*

Total Credits: 30

In addition

Once per year, biomedical engineering MS students must register for Colloquium in Biomedical Engineering (BE-GY 9730, 0 credits) and Seminar in Biomedical Engineering (BE-GY 9740, 0 credits).

For all students in the Bioinstrumentation track, remaining credits (up to 9 credits) must be selected from the list of electives, unless permission is granted by the biomedical engineering graduate adviser to substitute a course not listed below.

Electives

The list below contains the elective courses that are available to students pursuing an MS degree in the Bioinstrumentation track.

- BE-GY 6203 Medical Imaging I *3 Credits*
  Or ECE-GY 6813 Medical Imaging *3 Credits*
- BE-GY 6353 Special Topics in Biomedical Engineering *3 Credits*
- BE-GY 6463 Biostatistics for Biomedical Engineers *3 Credits*
- BE-GY 6603 Drug Delivery *3 Credits*
- BE-GY 6753 Biomechanics and Biomaterials in Orthopaedics *3 Credits*
- BE-GY 6803 Biomaterials: Engineering Principles and Design Considerations *3 Credits*
- BE-GY 871x Guided Studies in Biomedical Engineering *3-6 Credits, each 3 Credits*
- BE-GY 9443 Tissue Engineering *3 Credits*
- BE-GY 9753 Bioethics Seminar *3 Credits*
- BT-GY 6063 Molecular Immunology *3 Credits*
- CM-GY 9433 Protein Engineering *3 Credits*
- CS-GY 6643 Computer Vision *3 Credits*
- ECE-GY 6123 Image and Video Processing *3 Credits*
- ECE-GY 6143 Machine Learning *3 Credits*
- ECE-GY 6183 Digital Signal Processing Laboratory *3 Credits*
- ECE-GY 6483 Real Time Embedded Systems *3 Credits*
- MATH-GA 2852.001 Advanced Topics in Math Biology *4 Credits*
- ME-GY 7863 Special Topics in Mechanical Engineering *3 Credits*
- PH-GY 6403 Physical Concepts of Polymer Nanocomposites *3 Credits*
- BMSC-GA 4404 Fundamental concepts of MRI *3 Credits*
- BMSC-GA 4409 Advanced MRI *3 Credits*
- BMSC-GA 4427 Practical MRI I *6 Credits*
- BMSC-GA 4428 Practical MRI II *6 Credits*
- BMSC-GA 4469 Positron Emission Tomography *3 Credits*

Biomedical Engineering, Biomaterials Track, M.S.

The Curriculum

Requirements for the Master of Science

Each track within the BME MS program includes two options. The first specifies course requirements that include research with submission of a master's thesis. The second option specifies course requirements plus research performed as guided studies. Students who choose the master's thesis option must register for 6 credits of BE-GY 997x and then write and defend a master's thesis according to School guidelines. Those students electing the thesis option will also be required to take training in laboratory safety.

Biomedical Engineering-Biomaterials Track

To meet graduation requirements, students must have an overall B average in all courses (including MS thesis, research or guided studies) and must not have more than two grades of C in required (core) subjects.

Required courses for all students in the **Biomaterials** Track that fulfill their requirements for an MS in Biomedical Engineering are shown below:

Required Courses

- BE-GY 6103 Anatomy, Physiology and Biophysics I *3 Credits*
- BE-GY 6113 Anatomy, Physiology and Biophysics II *3 Credits*
- BE-GY 6463 Biostatistics for Biomedical Engineers *3 Credits*
- BE-GY 6753 Biomechanics and Biomaterials in Orthopaedics *3 Credits*
- BE-GY 6803 Biomaterials: Engineering Principles and Design Considerations *3 Credits*
- BE-GY 9443 Tissue Engineering *3 Credits*
- BE-GY 9730 Colloquium in Biomedical Engineering *0 Credits*
- BE-GY 9740 Seminar in Biomedical Engineering *0 Credits*
- BT-GY 6063 Molecular Immunology *3 Credits*
- CM-GY 9433 Protein Engineering *3 Credits*

Electives

- You may choose up to 6 credits from the list of electives below, subject to the Research option chosen.

Research Options

- BE-GY 871x Guided Studies in Biomedical Engineering *3-6 Credits, each 3 Credits*
- BE-GY 997x MS Thesis in Biomedical Engineering *6-9 Credits, each 3 Credits*

Total Credits: 30

In addition

Once per year, biomedical engineering MS students must register for Colloquium in Biomedical Engineering (BE- GY 9730, 0 credits) and Seminar in Biomedical Engineering (BE-GY 9740, 0 credits).

For all students in the Biomaterials track, remaining credits (up to 6) must be selected from the list of electives unless permission is granted by the biomedical engineering graduate adviser to substitute a course not listed below.

Electives

The list below contains the elective courses that are available to students pursuing an MS degree in the Biomaterials track.

- BE-GY 6203 Medical Imaging I *3 Credits*
  or ECE-GY 6813 Medical Imaging *3 Credits*
- BE-GY 6303 Bio-optics *3 Credits*
- BE-GY 6353 Special Topics in Biomedical Engineering *3 Credits*
- BE-GY 6403 Digital Signal Processing I *3 Credits*
  or ECE-GY 6113 Digital Signal Processing I *3 Credits*
- BE-GY 6453 Probability and Stochastic Processes *3 Credits*
  or ECE-GY 6303 Probability and Stochastic Processes *3 Credits*

- BE-GY 6503 Bioinstrumentation *3 Credits*
- BE-GY 6603 Drug Delivery *3 Credits*
- BE-GY 871x Guided Studies in Biomedical Engineering *3-6 Credits, each 3 Credits*
- BE-GY 9753 Bioethics Seminar *3 Credits*
- CBE-GY 6153 Applied Mathematics in Engineering *3 Credits*
- CS-GY 6643 Computer Vision *3 Credits*
- ECE-GY 6123 Image and Video Processing *3 Credits*
- ECE-GY 6143 Machine Learning *3 Credits*
- ECE-GY 6183 Digital Signal Processing Laboratory *3 Credits*
- ECE-GY 6483 Real Time Embedded Systems *3 Credits*
- MA-GA 2852.001 Advanced Topics in Math Biology *4 Credits*
- ME-GY 7863 Special Topics in Mechanical Engineering *3 Credits*
- PH-GY 6403 Physical Concepts of Polymer Nanocomposites *3 Credits*
- BMSC-GA 4404 Fundamental concepts of MRI *3 Credits*
- BMSC-GA 4409 Advanced MRI *3 Credits*
- BMSC-GA 4427 Practical MRI I *6 Credits*
- BMSC-GA 4428 Practical MRI II *6 Credits*
- BMSC-GA 4469 Positron Emission Tomography *3 Credits*

Biomedical Engineering, Medical Imaging Track, M.S.

The Curriculum

Requirements for the Master of Science

Each track within the BME MS program includes two options. The first specifies course requirements that include research with submission of a master's thesis. The second option specifies course requirements plus research performed as guided studies. Students who choose the master's thesis option must register for 6 credits of BE-GY 997x and then write and defend a master's thesis according to School guidelines. Those students electing the thesis option will also be required to take training in laboratory safety.

Biomedical Engineering—Medical Imaging Track

To meet graduation requirements, students must achieve an overall B average in all courses (including MS thesis, research or guided studies) and must not have more than two grades of C in required (core) subjects.

Listed below are required (core) courses for students in the **Medical Imaging** track that fulfill the requirements for an MS in Biomedical Engineering.

Required Courses:

- BE-GY 6103 Anatomy, Physiology and Biophysics I *3 Credits*
- BE-GY 6113 Anatomy, Physiology and Biophysics II *3 Credits*
- BE-GY 6403 Digital Signal Processing I *3 Credits* OR ECE-GY 6113 Digital Signal Processing I *3 Credits*
- BE-GY 6203 Medical Imaging I *3 Credits* OR ECE-GY 6813 Medical Imaging *3 Credits*

- BE-GY 6453 Probability and Stochastic Processes *3 Credits*
- ECE-GY 6303 Probability and Stochastic Processes *3 Credits*
- ECE-GY 6123 Image and Video Processing *3 Credits*
- CBE-GY 6153 Applied Mathematics in Engineering *3 Credits*
- BE-GY 9730 Colloquium in Biomedical Engineering *0 Credits*
- BE-GY 9740 Seminar in Biomedical Engineering *0 Credits*

Electives

- You may choose up to 9 credits from the list of electives below, subject to the Research option chosen.

Research Options

- BE-GY 871x Guided Studies in Biomedical Engineering *3-6 Credits, each 3 Credits*
- BE-GY 997x MS Thesis in Biomedical Engineering *6-9 Credits, each 3 Credits*

Total Credits: 30

In addition

Once per year, biomedical engineering MS students must register for Colloquium in Biomedical Engineering (BE-GY 9730, 0 credits) and Seminar in Biomedical Engineering (BE-GY 9740, 0 credits).

For all students in the Medical Imaging track, remaining credits (up to 9 credits) must be selected from the list of electives, unless permission is granted by the biomedical engineering graduate adviser to substitute a course not listed below.

Electives

The list below contains the elective courses that are available to students pursuing an MS degree in the Medical Imaging track.

- BE-GY 6303 Bio-optics *3 Credits*
- BE-GY 6353 Special Topics in Biomedical Engineering *3 Credits*
- BE-GY 6463 Biostatistics for Biomedical Engineers *3 Credits*
- BE-GY 6503 Bioinstrumentation *3 Credits*
- BE-GY 6603 Drug Delivery *3 Credits*
- BE-GY 6753 Biomechanics and Biomaterials in Orthopaedics *3 Credits*
- BE-GY 6803 Biomaterials: Engineering Principles and Design Considerations *3 Credits*
- BE-GY 871x Guided Studies in Biomedical Engineering *3-6 Credits, each 3 Credits*
- BE-GY 9443 Tissue Engineering *3 Credits*
- BE-GY 9753 Bioethics Seminar *3 Credits*
- BT-GY 6063 Molecular Immunology *3 Credits*
- CM-GY 9433 Protein Engineering *3 Credits*
- CS-GY 6643 Computer Vision *3 Credits*

- ECE-GY 6143 Machine Learning *3 Credits*
- ECE-GY 6183 Digital Signal Processing Laboratory *3 Credits*
- ECE-GY 6483 Real Time Embedded Systems *3 Credits*
- MA-GA 2852.001 Advanced Topics in Math Biology *4 Credits*
- ME-GY 7863 Special Topics in Mechanical Engineering *3 Credits*
- PH-GY 6403 Physical Concepts of Polymer Nanocomposites *3 Credits*
- BMSC-GA 4404 Fundamental concepts of MRI *3 Credits*
- BMSC-GA 4409 Advanced MRI *3 Credits*
- BMSC-GA 4427 Practical MRI I *6 Credits*
- BMSC-GA 4428 Practical MRI II *6 Credits*
- BMSC-GA 4469 Positron Emission Tomography *3 Credits*

Doctor of Philosophy

Biomedical Engineering, Ph.D.

The primary goal of the PhD in Biomedical Engineering [BME] is to provide students with an in-depth, advanced education that will give them the tools needed to perform fundamental and applied research in biomedical engineering. Alternatively, students will gain the requisite technical knowledge that they may wish to apply to management, marketing, sales, and other entrepreneurial activities related to biomedical engineering.

Specific Objectives include:
• To provide students that have either a BS or an advanced degree in any engineering; mathematics; or natural science discipline with a tailored program of study that will ensure their competency and competitiveness in BME.
• To provide students with a cutting edge program that integrates engineering, biological and medical sciences such that students will acquire the requisite skills to participate in technological innovations that provide people with longer, healthier and more productive lives.
• To better accomplish the above, to merge the leadership and talents found at NYU Tandon in chemistry, engineering and computer science with the expertise in medical sciences at the Health Sciences Center at SUNY Downstate Medical Center.
• To give students an opportunity to focus on topics that include: 1) Biomaterials and Polymer Therapeutics; 2) Bio-imaging and Neuro-engineering.
• To give students the option of doing research in the laboratories at NYU Tandon or SUNY Downstate Medical Center. Students may also substitute research units with course electives.

STRUCTURE AND REQUIREMENTS FOR DEGREE COMPLETION:
The PhD degree in Biomedical Engineering is awarded to a student upon successful completion of 75 credits and the defense of a comprehensive thesis research project. The credits are broken down as 39 course credits and 36 doctoral thesis research credits. A maximum of 30 course credits may be transferred from previous graduate course work. Thesis credits can only be taken upon passing the qualifying exam.

The program has three separate, entry-level pathways to accommodate students entering with a bachelor's degree in any of the following disciplines: (1) chemical engineering; (2) mechanical engineering, electrical engineering, computer science engineering or physics; and (3) chemistry, biology or premedical studies. By accommodating these students with varying academic backgrounds, we intend to further encourage communication, in keeping with the interdisciplinary nature of biomedical engineering. Students will be required to take at least one, but not more than two, of NYU Tandon School of Engineering's management of technology courses. Students will be obliged to participate in BE-GY 9753 Bioethics Seminar, a course on responsible conduct in research, as required by the National Institutes of Health (NIH) for training grant funding joint institutionally; to participate in Journal Clubs; and to attend the jointly sponsored SUNY/NYU Tandon Biomedical Engineering Seminar Series. The required PhD thesis research may be conducted under the supervision of a faculty member from either institution. We expect that these students will need four to six years to complete the doctoral program, depending upon their admission status.

Candidates whose thesis research advisors are NYU Tandon faculty will be required to register at NYU Tandon and will accumulate a minimum total of 75 credits; whereas those candidates whose thesis research advisers are SUNY Downstate [SGS] faculty will be required to register at Downstate and will accumulate the requisite number of credits specified by SGS's degree requirement. The same joint PhD degree will be conferred regardless of the campus at which the student registers; the research requirements for all graduate students in the program are identical.

Each student will be required to register for all of the courses through the standard registration process at student's home institution, irrespective of where the courses are actually held. The Registrars at each institution will keep accounts of the numbers of credits taken by their BME PhD students at the alternate institution. Those credits will be tallied at the close of every two academic years, or every other June.

Passing a doctoral qualifying examination, scheduled within the first two years, is required to advance to candidacy for the PhD degree. Students are directed to read the information within the **Qualifying Examination Guidelines**, below. In the case of failure, the right to a second examination is at the discretion of the examination committee in consultation with the BME program directors at NYU Tandon and SUNY Downstate, and the graduate dean or associate dean from the campus at which the BME student is enrolled. The results of each student's examination will be delivered to the Registrar of the NYU Tandon and SGS, in writing, no later than one week following the exam.

PROGRAM ADMISSION

An admission committee composed of faculty from both SGS and NYU Tandon will review BME PhD applications. Requirements for acceptance to the program will include (1) academic excellence, (2) interests congruent with those of program faculty, and (3) positive recommendations from former research advisors. Admissions committee member and faculty members whose research interests match those of the candidate, either in person or by a conference call, will interview all viable candidates.

Bachelor's level students accepted into the BME PhD program will be expected to register at the campus where the faculty research best matches their own interests. While this early commitment to a research area is dissimilar to other doctoral programs at SGS, it is essential given the early tuition and stipend obligations at NYU Tandon . A faculty thesis advisor must accept students with an MS who wish to enter the BME PhD before they will be allowed to enroll.

Thesis Research: Procedures for academic advising, and for supervision and evaluation of students' progress through degree completion.

Members of the student's thesis/advisory committee, with the participation of the BME program director, will monitor the individual student's progression through the BME PhD program, as in the other doctoral programs at SGS and NYU Tandon. To accommodate the changing needs of each student based upon his or her research project, the composition of the committee is designed for flexibility. At each stage of a student's career it is important to determine if they are progressing at a rate sufficient for success as a doctoral candidate. This includes the successful and timely completion of course work and examinations. The following schedule is suggested:

Year 1: Both BS or MS level students are expected to register for course work to prepare for their doctoral qualifying examination.

Year 2: The qualifying examination committee will be formed and consist of three members; one must hold a PhD in an engineering discipline. Student will take the doctoral qualifying examination. Those that pass are allowed to continue to year 3 as doctoral candidates and will be allowed to register for BE-GY 999X PhD Thesis Research in Biomedical Engineering.

Year 3: The thesis/advisory committee will be formed. This committee will consist of six members, selection of which will be primarily based on the area of the student's research. All attempts should be made to include a least two members from the student's qualifying exam committee, one member should have expertise within the track focus chosen by the student; one member should have a PhD in engineering; two members should be from a department other than the one in which the thesis advisor is affiliated. The sixth member, an outside examiner, should be selected and be present at the thesis pre-defense, and may also become involved in the proposal defense, at the student and advisor's invitation.

Year 4: The thesis/advisory committee, including the external member, will monitor student progress during the thesis pre-defense. Internal members of the thesis research advisory committee monitor the thesis defense; attendance by the external member at the thesis defense is optional.

Below is a chronological description of the process by which a student will progress from thesis proposal to thesis defense.

Student submits written version of thesis proposal to the committee two weeks in advance of the Oral Proposal defense.

1. Oral Proposal Defense. This is a formal presentation by the student before the program's students and faculty.
2. Chair of committee writes a letter to the student containing the committee's determination of the proposal defense (Acceptable, Acceptable with Modifications or Unacceptable). The letter should describe what experiments are required for completion of the thesis work. This is a contract with the student.
3. Student submits written thesis to committee, including to the outside examiner, two weeks in advance of the Pre-defense of the thesis.
4. Pre-defense. Student must defend a written document and respond to questions regarding research. (The format is oral. A formal presentation on the part of the student is discouraged; a brief informal presentation may occur if desired by the chairman.)
5. Chair of committee writes a letter to student containing the committee's determination of what changes are required for the final document.
6. Student submits final document to committee members two weeks prior to the defense, or one week if agreed upon by all committee members.
7. Defense. First there is a formal, public presentation by the student, with questions from the audience. Following the public presentation, the student meets privately with the committee members for questions. The committee makes a decision that is then transmitted, in writing, to the Registrar.

QUALIFYING EXAM GUIDELINES

A two-part qualifying examination, scheduled for no later than the fall semester of the second year, is required to advance to candidacy for the Ph.D. degree. Students must submit a formal application to take the exam during registration for the spring semester of that year. The application should include the names of three or more faculty who are willing to serve on the qualifying examination committee; these must be approved by the Program Director of the student's home campus. The committee must have at least one faculty member from the campus not directly sponsoring the student, and a member or designee of the executive committee.

The purpose of the qualifying examination is to test general knowledge of Bioengineering, and in particular knowledge that is pertinent to the track in which the student is enrolled, and is intended to discern the student's ability to communicate ideas and concepts. While the exam is a test of general knowledge, students are expected to be especially knowledgeable in the scientific area related to their proposed research.

The format of the examination is in two parts. In part one the student will receive one essay question from each of the examiners that they will have one week to answer. The thesis examining committee will either pass or fail the student on this written part. If this part of the examination is passed, the student will be allowed to take the oral part of the examination.

During the oral part of the examination, questions from the committee will not necessarily be limited to the student's essay questions, but may cover other aspects of the student's academic training up to that point. The intent is to focus the committee's attention, and to make the members aware of the areas of interest in which the student might be expected to have particular knowledge.

The examination will be graded as pass or fail by majority vote. In the case of failure, the right to a second examination is at the discretion of the executive committee and the Graduate Dean or Associate Dean for Biomedical Engineering of the campus at which the student is enrolled. An unsatisfactory performance in the qualifying examination may result in cancellation of the student's registration in the sponsoring program. The decision of whether to cancel registration in the program or to offer an opportunity for reexamination is made by the Executive Committee of the Program on the basis of the student's overall academic performance. This decision is not subject to formal appeal.

The result of each student's examination will be delivered to the Graduate School, in writing, no later than one week following the exam.

Department of Chemical and Biomolecular Engineering

Chair: David Pine

Programs offered:

- Biomolecular Science
- Biotechnology
- Biotechnology and Entrepreneurship
- Chemical and Biomolecular Engineering
- Chemical Engineering
- Materials Chemistry

Faculty

Professors

Stephen Arnold, University and Thomas Potts Professor
PhD, City University of New York
Optics, biophotonics, microparticle photophysics, physical virology, organic solid-state physics

Eray Aydil, Alstadt-Lord-Mark Professor
PhD, University of Houston
Electrochemical materials and devices; Electronic, magnetic and photonic materials; Energy, materials processing; Nanomaterials and nanotechnology

Bruce A. Garetz, Professor
PhD, Massachusetts Institute of Technology
Laser spectroscopy, laser light scattering, non-linear optics, laser-induced nucleation and multiphoton processes

Rastislav Levicky, Professor
PhD, University of Minnesota
Biological polyelectrolytes, biosensors and bio-diagnostics

John T. McDevitt, Professor, Chair of Department of Biomaterials and Biomimetics, NYUCD
PhD, Stanford University
Microdevices, biomaterials

Jovan Mijovic, Professor
PhD, University of Wisconsin at Madison
Relaxation dynamics in synthetic and biological complex systems, modeling of processing of polymers

Jin Kim Montclare, Professor
PhD, Yale University
Molecular design, protein engineering, biomaterials and biocatalysis

David Pine, Silver Professor and Department Chair
PhD, Cornell University
Soft condensed matter physics, mesoscopic materials

Elisa Riedo, Professor
PhD, University of Milan
Nano-confined liquids; nanotribology; nanomechanics; thermochemical nanolithography

Iwao Teraoka, Professor
PhD, University of Tokyo (Japan)
Photonic molecular sensors, whispering gallery modes

Abraham Ulman, Professor
PhD, The Weizmann Institute (Israel)
Self-assembled monolayers, surface engineering and nanotechnology

Associate Professors

Ryan L. Hartman, Associate Professor
PhD, University of Michigan
Catalysis and reaction engineering, continuous-flow manufacturing, flow chemistry, microchemical systems, and molecular management

Jin Ryoun Kim, Associate Professor
PhD, University of Wisconsin at Madison
Protein engineering, structure and properties of proteins

André Taylor, Associate Professor
PhD, University of Michigan
Novel materials and devices for energy conversion and storage

Assistant Professors

Miguel Modestino, Assistant Professor
PhD, University of California, Berkeley
Electrochemical devices; composite materials development, processing and characterization

Nathalie Pinkerton, Assistant Professor
PhD, Princeton University
Responsive soft materials for biomedical applications, functional soft materials via scalable synthetic processes, and material behavior in biological systems

Ayaskanta Sahu, Assistant Professor
PhD, University of Minnesota, Twin Cities
Investigating transport phenomena in new classes of nanostructured hybrid materials that have promise for optoelectronic and thermoelectric energy conversion

Industry Professors

Evgeny Vulfson, Industry Professor
PhD, Moscow State University
Biotechnology product and process development

Industry Associate Professors

Donghong Sun, Industry Associate Professor
PhD, Columbia University

Julia Robinson-Surry, Industry Associate Professor
PhD, Massachusetts Institute of Technology

Industry Assistant Professors

Yanir Maidenberg, Industry Assistant Professor
PhD, Columbia University

Xin Wang, Industry Assistant Professor
PhD, New York University

Lecturers

Myron I. Pollack, Senior Lecturer
PhD, New York University

Research Faculty

Kalle Levon, Research Professor
PhD, University of Tokyo
Phase separation in polymer blends and solutions, gelation, conductive polymers

Yoshiyuki Okamoto, Research Professor and Director of the Polymer Research Institute
PhD, Purdue University
Organic and polymer synthesis characterization and applications

Faculty Emeriti

Mark M. Green, Professor Emeritus
PhD, Princeton University

Nancy M. Tooney, Associate Professor Emerita
PhD, Brandeis University

Biotechnology and Entrepreneurship

Program Director: Evgeny Vulfson

Goals and Objectives

The goal of the Biotechnology and Entrepreneurship, M.S. program is to supplement students' knowledge of biotechnology beyond the BS level and provide a basic understanding of the business side of the biotech industry and the requirements for starting their own biotechnology businesses. The program provides broad coverage of key areas of modern biotechnology combined with a wide choice of business- and finance-related courses.

This program is most suitable for mature students with work experience and recent graduates who aspire to be entrepreneurs and establish their own biotech enterprise.

Master of Science

Biotechnology and Entrepreneurship, M.S.

Requirements for the Masters of Science

Students entering this program should have an undergraduate degree in a science or engineering discipline and must have taken undergraduate courses in biochemistry and cell and molecular biology. The 30-credit curriculum of this program comprises three parts:

1. Four required courses offering a broad overview of cutting-edge areas of biotechnology: biocatalysis and biomaterials, biotechnology and health care, biosensors and biochips, biotechnology and the pharmaceuticals industry (12 credits).
2. One required and a wide choice of elective 1.5- and 3-credit courses on technology innovation, intellectual-property management, finances, marketing, business-plan preparation and fund-raising (12 credits).
3. Two more electives up to 6 credits or an optional project involving either technology-competition analysis and business-plan preparation or a placement in an early-stage start-up company (6 credits).

To meet graduation requirements, students must attain an overall GPA of 3.0 (average of a B) in all their courses and at least a B- in each of the required courses. Students also must take at least 15, but no more than 20, credits of Biotechnology or related courses, including 4 required courses, listed below.

Required Courses: 15 Credits

The five required courses are listed below:

- BTE-GY 6013 Biotechnology and the Pharmaceutical Industry *3 Credits*
- BTE-GY 6023 Biotechnology and Health Care *3 Credits*
- BTE-GY 6033 Biosensors and Biochips *3 Credits*
- BTE-GY 6043 Biocatalysis in Industry *3 Credits*
- MG-GY 7703 Entrepreneurship *3 Credits*

Elective Courses: 6-15 Credits

Students must take courses from the list below, which will amount to at least 6 credits in total; e.g., two 3-credit or four 1.5-credit courses:

- BT-GY 6053 Introduction to Neuroscience for Biotechnologists *3 Credits*
- BT-GY 6063 Molecular Immunology *3 Credits*
- BT-GY 6093 Biomedical Materials & Devices for Human Body Repair *3 Credits*
- BT-GY 7013 Special Topics in Biotechnology *3 Credits*
- BT-GY 7033 Business Concepts for the Biotechnology Entrepreneur *3 Credits*
- BT-GY 7043 Computer-Aided Protein and Drug Design *3 Credits*
- BT-GY 9433 Protein Engineering *3 Credits*
- BT-GY 9443 Tissue Engineering *3 Credits*
- MG-GY 6013 Organizational Behavior *3 Credits*
- MG-GY 6073 Marketing *3 Credits*
- MG-GY 6083 Economics *3 Credits*
- MG-GY 6093 Accounting & Finance *3 Credits*
- MG-GY 6103 Management Science *3 Credits*
- MG-GY 6123 Human Resource Management *3 Credits*
- MG-GY 6303 Operations Management *3 Credits*
- MG-GY 7953 Global Innovation *3 Credits*
- MG-GY 8203 Project Management *3 Credits*
- MG-GY 8273 Contracts and Specifications *3 Credits*
- MG-GY 8643 New Product Development *3 Credits*
- MG-GY 8653 Managing Technological Change and Innovation *3 Credits*
- MG-GY 8673 Technology Strategy *3 Credits*

Note:

Subject to advisor's approval students can also take an elective course at other Schools of NYU (up to 9 credits). For example, Biotechnology and Entrepreneurship students can select a course at NYU Stern School of Business.

Projects

Students may take up to three Projects in Biotechnology and Entrepreneurship:

- BTE-GY 950x Project in Biotechnology and Entrepreneurship *0.5-3 Credits*
- BTE-GY 9513 Project in Biotechnology and Entrepreneurship *3 Credits*

- BTE-GY 9523 Project in Biotechnology and Entrepreneurship *3 Credits*

Note:

Projects in Biotechnology and Entrepreneurship count as elective courses.

Total: 30 Credits

Biotechnology

Academic Adviser: Evgeny Vulfson

Goals and Objectives

The main goal of the Biotechnology, M.S. program is to advance students' knowledge and experience beyond the BS level and equip them for the rapidly evolving, life-sciences-based industries. The program provides students with a broad and comprehensive coverage of established and emerging bio-technologies. Course topics range from industrial application of enzymes and bio-polymer synthesis to the modern drug design and the role of biotechnology in health care. The availability of many elective courses enables students to specialize further in selected biotechnology areas. The program includes a guided study to develop analytical skills. The students are trained to perform at the entry-/mid-managerial level in life-sciences-based industries and other organizations involved in biotechnology-related work.

Master of Science

Biotechnology, M.S.

Requirements for the Masters of Science

Students are expected to have an undergraduate degree in a science or engineering discipline and must have taken undergraduate courses in (1) biochemistry and (2) cell and molecular biology, or they may take these classes at the NYU Tandon School of Engineering. The 30-credit curriculum consists of three parts:

1. Five required courses in biotechnology, protein and tissue engineering, enzyme catalysis and biosensors (15 credits);
2. Three elective courses in biotechnology and related fields (9 credits); and
3. Two more elective courses or Guided Studies in Biotechnology, involving laboratory or literature work (6 credits).

To meet graduation requirements, students must attain an overall GPA of 3.0 (average of a B) in all their courses.

Required Courses: 15 Credits

The five required courses are listed below:

- BT-GY 6013 Biotechnology and the Pharmaceutical Industry *3 Credits*

- BT-GY 6023 Biotechnology and Health Care *3 Credits*
- BT-GY 6033 Biosensors and Biochips *3 Credits*
- BT-GY 6043 Biocatalysis in Industry *3 Credits*

Choose one of the following:

- BT-GY 6093 Biomedical Materials & Devices for Human Body Repair *3 Credits*
- BT-GY 9433 Protein Engineering *3 Credits*

Elective Courses: 9-15 Credits

Students must select courses from the following list:

- BE-GY 6013 Molecular Immunology *3 Credits*
- BT-GY 6053 Introduction to Neuroscience for Biotechnologists *3 Credits*
- BT-GY 6063 Molecular Immunology *3 Credits*
- BT-GY 6073 Genetic Engineering *3 Credits*
- BT-GY 6083 Advanced Cell and Molecular Biology *3 Credits*
- BT-GY 7011 Special Topics in Biotechnology *1.5 Credits*
- BT-GY 7013 Special Topics in Biotechnology *3 Credits*
- BT-GY 7033 Business Concepts for the Biotechnology Entrepreneur *3 Credits*
- BT-GY 7043 Computer-Aided Protein and Drug Design *3 Credits*
- BT-GY 9053 Enzyme Catalysis in Organic Synthesis *3 Credits*
- BT-GY 9443 Tissue Engineering *3 Credits*

Note:

Subject to advisor's approval students can also take an elective course and/or do research at other Schools of NYU (up to 9 credits). Typically, Biotechnology students choose NYU School of Medicine.

Guided Studies: up to 6 Credits

Students may optionally enroll in up to two Guided Studies courses (one per semester), which involve laboratory or literature work, as arranged with their advisers. Guided Studies courses count as elective courses.

- BT-GY 871X Project in Biotechnology *0.5-3 Credits*
- BT-GY 8713 Guided Studies in Biotechnology I *3 Credits*
- BT-GY 8723 Project in Biotechnology *3 Credits*

Total: 30 Credits

Biomolecular Science

Academic advisers:
Bruce Garetz and Evgeny Vulfson

Advances in biology, particularly at the cellular and molecular level, are changing the world. The basic knowledge of how nature functions to create and sustain life on earth is increasingly applied to advancing health care, to feeding an expanding world population, to producing cheap energy from renewable sources, and to cleaning the environment. Biology is the enabling science of the 21st century and is creating numerous future job-market opportunities. The BS in Biomolecular Science lies at the interface between biology and chemistry and builds upon the understanding of molecular-level biology. The curriculum also provides a strong foundation in mathematics and physics. This broadly based science education is a prerequisite for successful careers in industry and governmental laboratories and for professional or graduate studies in the biological sciences, medicine and other health-related fields.

The BS in Biomolecular Science provides students with the fundamental knowledge and skills needed to work in the rapidly changing, bio-related industries or to pursue advanced professional or graduate degrees. The highly innovative curriculum spans the boundaries between biology and chemistry and involves considerable exposure to research.

The BS in Biomolecular Science is a vigorous pre-med program that prepares students well for the MCAT exam. Tandon also has a special Advisory Committee (https://engineering.nyu.edu/academics/support-services/undergraduate/prehealth) to assist students who are interested in health-related professions.

Goals and Objectives

The goal of the BS in Biomolecular Science is to provide the fundamental knowledge and skills to work and advance in the rapidly changing, bio-related industries or to pursue advanced professional or graduate degrees. This goal is reached with an innovative curriculum that spans the boundaries between biology and chemistry and through exposure to research. In this way, the program attracts and trains adaptable and active learners.

BS/MS Program

Strong students can also apply to the BS/MS Program where it's possible to earn the BS and MS degrees within approximately 5 years. Possible BS/MS combinations include a BS in biomolecular science with a MS in chemistry, bioinformatics, biotechnology, biotechnology and entrepreneurship, or biomedical engineering.

See the BS/MS Program description for further information.

Requirements for the Bachelor of Science

Subject / Credits Required

- Chemistry / 28
- Biology / 25
- Research / 8
- Computational / 3
- Engineering and Technology Forum / 1
- Writing / 8
- Humanities and Social Science Electives / 16
- Mathematics / 8
- Physics / 11
- Electives / 20
- **TOTAL / 128**

A minimum of 128 credits is required for the BS in Biomolecular Science.

Bachelor of Science

Biomolecular Science, B.S.

Typical Course of Study for the Bachelor of Science in Biomolecular Science

Freshman Year

Fall Semester: 17 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits* [1]
- CM-UY 1014 General Chemistry I *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- BMS-UY 1003 Introduction to Cell and Molecular Biology *3 Credits*
- BMS-UY 1001 Introduction to Cell and Molecular Biology Laboratory *1 Credits*

Spring Semester: 18 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits* [1]
- CM-UY 1024 General Chemistry II *4 Credits*
- BMS-UY 2003 Introduction to Physiology *3 Credits*
- BMS-UY 2001 Introduction to Physiology Laboratory *1 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- BMS-UY 1032 Introduction to Biomolecular Science *2 Credits* [2]

Sophomore Year

Fall Semester: 16 Credits

- CM-UY 2213 Organic Chemistry I *3 Credits*
- CM-UY 2211 Organic Chemistry Laboratory I *1 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- CS-UY 1133 Engineering Problem Solving and Programming *3 Credits* or CS-UY 1113 Problem Solving and Programming I *3 Credits* or CS-UY 1114 Intro to Programming & Problem Solving *4 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]
- Elective *2 Credits* [4]

Spring Semester: 16 Credits

- CM-UY 2223 Organic Chemistry II *3 Credits*

- CM-UY 2221 Organic Chemistry Laboratory II *1 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- CM-UY 2614 Physical Chemistry I *4 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Junior Year

Fall Semester: 16 Credits

- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- BMS-UY 3614 Advanced Molecular Biology *4 Credits*
- CM-UY 3314 Biochemistry I *4 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Spring Semester: 15 Credits

- BMS-UY 3513 Biostatistics *3 Credits*
- BMS-UY 3714 Advanced Cell Biology *4 Credits*
- CM-UY 3323 Biochemistry II *3 Credits*
- CM-UY 4011 Information Sources for the Chemical Sciences *1 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Senior Year

Fall Semester: 14-16 Credits

- BMS-UY 3114 Genetics *4 Credits*
- Elective *3-4 Credits* [4]
- Elective *3-4 Credits* [4]
- BMS-UY 4914 Undergraduate Research in Biomolecular Science *4 Credits* [5]

Spring Semester: 13-16 Credits

- BMS-UY 4924 Undergraduate Research in Biomolecular Science *4 Credits* [5]
- Elective *3-4 Credits* [4]
- Elective *3-4 Credits* [4]
- Elective *3-4 Credits* [4]

Total credits required for graduation: 128

Footnotes

[1] Students placed by examination or an adviser into MA-914 must defer registration for MA-UY 1024; MA-UY 1024/1124 may be replaced with MA-UY 1324/1424.

[2] BMS-UY 1032/CM-UY 1032 cannot be taken by and is not required for transfer students or students changing major after the freshman year.

[3] Choice of Humanities and Social Sciences electives must conform to the Tandon requirements described in the Bulletin. At least one elective must be an ethics course, such as PL-UY 2144. At least one elective must be at the 3xxx/4xxx level. At least one elective must be a writing-intensive course labeled by "W" and must be taken at Tandon. Students may take a maximum of 4 courses or 16 credits at other schools of NYU.

[4] Elective options:

(i) At least 6 credits of technical electives must be selected from the following courses: BMS-UY (level 2, 3, and 4), CM-UY (level 3 and 4), BT-GY, BE-GY and BI-GY (collectively referred to as "Group 1").

(ii) At least 6 credits of technical electives must be selected from the following courses: A Group 1 course (as defined above), MA-UY, CS-UY, PH-UY, CBE-UY or, with advisor's permission a technical elective related to BMS major at another school of NYU (collectively referred to as "Group 2"). Students may take a maximum of 4 courses or 16 credits at other schools of NYU.

(iii) The remaining courses (up to 8 credits) are free electives, for example, a course related to management, finance, or media studies (advisor's permission is required).

[5] Students electing senior research must take both semesters of research and write a BS thesis. Students may replace research and thesis with 8 credits of technical electives from Group 1 or Group 2, but at least one course must be chosen from Group 1.

Required safety trainings: All sophomore BMS and CBE majors must enroll in (on BioRaft) and complete three one-hour training sessions offered by the NYU EHS (Environmental Health and Safety) Office. The three sessions are: Lab Safety, Waste Management and Biosafety. Student must show proof (e.g. certificate) that they completed this training to their advisors at their next advisement meeting in order to have their registration holds removed. Each subsequent fall they must take three online refresher sessions until they graduate.

Residency requirements: To satisfy residency requirements for the BS degree students must complete a minimum of 64 credits at the University in approved coursework. In addition, students must complete their final 32 credits at the University, unless approved for a special term abroad.

NOTE: The department usually does not grant transfer credits to students who, while registered at the NYU Tandon School of Engineering, take biology or chemistry courses at other universities.

Summary of requirements for the BS degree:

<u>Subject / Credits Required</u>

- Chemistry / 28
- Biology / 25
- Research / 8
- Computational / 3
- Engineering and Technology Forum / 1
- Writing / 8
- Humanities and Social Science Electives / 16
- Mathematics / 8
- Physics / 11
- Electives / 20

- **TOTAL / 128**

Chemical and Biological Engineering

Academic Directors:
Rastislav Levicky (undergraduate)
Jovan Mijovic (graduate)

Chemical and biomolecular engineers rely heavily on science, engineering methods, experience and inventiveness to develop the processes and equipment required for economical production of new and useful products. Chemical and biomolecular engineers have contributed to developing virtually every material common to modern life. In addition to working with bulk chemicals and petroleum products, these engineers play key roles in producing plastics, pharmaceuticals, cosmetics, fertilizers and foodstuffs, synthetic rubber, rocket propellants, fuel cells, automatic controls, water desalination plants, missiles and artificial kidneys. New technologies, from sensors to the production of bulk chemicals from renewable bio-resources, require the unique skills of chemical and biomolecular engineers.

Chemical and biomolecular engineers may choose from a wide range of professional activities, including research, process and product development, design and supervision of the construction and operation of industrial plants, technical sales and services, consulting, management, teaching and entrepreneurship. Opportunities in chemical and biomolecular engineering are virtually unlimited.

The foundations of chemical and biomolecular engineering are the sciences, with emphasis on chemistry, biology, mathematics, physics and the engineering sciences including thermodynamics, fluid mechanics, kinetics and heat and mass transfer. Courses include the analysis, design and control of equipment, operations and processes. Students develop the knowledge and analytical skills necessary to bridge the gap between scientific advances and large-scale production of products.

Graduate Programs in Chemical Engineering

Chemical engineering graduate programs introduce advanced designs, research and development. The department offers graduate programs leading to a Master of Science in Chemical Engineering and Doctor of Philosophy in Chemical Engineering. A BS degree in chemical engineering or a related field of science or engineering is generally required for admission to graduate study. An applicant who has earned a bachelor's degree from a foreign institution must submit Graduate Record Examination and TOEFL scores. Applicants with degrees in other fields or from other colleges may be admitted with undergraduate or graduate deficiencies as evaluated by the graduate adviser. Students must have had at least one course in differential equations. NYU Tandon research areas include biopolymers at interfaces, bio-sensors, dynamics of complex fluids, nanotechnology and nanomaterials, process-systems engineering, protein engineering and biomolecular diagnostics.

Goals and Objectives

The objective of the MS degree in chemical engineering is to provide an understanding of the fundamental principles of chemical engineering subjects. The program enhances mathematical and analytical skills and emphasizes advanced design concepts. Students in the MS program develop a deeper understanding of engineering principles, and laboratory and research skills. They also conduct an in-depth study of a specialized chemical engineering topic through a guided studies project or a research thesis.

The PhD degree in chemical engineering provides advanced knowledge of fundamentals and research in emerging fields in chemical engineering. Research skills are refined, and the candidate performs original research that advances the understanding of a specific chemical engineering discipline. Faculty plan programs of study individually with each candidate. Systematic study toward a doctorate is guided by a guidance committee appointed by the Office of Research and PhD Programs.

Program options:

- Chemical and Biomolecular Engineering, B.S.
- Chemical Engineering, Guided Studies Option, M.S.
- Chemical Engineering, Thesis Option, M.S.
- Chemical Engineering, Ph.D.

Non-Degree

Biomolecular Science Minor

Students may obtain a minor in Biomolecular Science by taking 15 credits of BMS or CM courses chosen in consultation with a BMS advisor, not including those courses required by their major. At least 8 of the 15 credits must be taken at the NYU Tandon School of Engineering.

Contact Information

Bruce Garetz
bgaretz@nyu.edu

Bachelor of Science

Chemical and Biomolecular Engineering, B.S.

Undergraduate Program

The undergraduate program in chemical and biomolecular engineering provides a strong foundation in mathematics and the physical, chemical, and biological sciences. The program builds upon these core fundamentals to provide students with a thorough understanding of their applications in chemical engineering practice, emphasizing universality of natural laws and engineering principles whether at the scale of molecular systems or industrial processes. This is accomplished through an integrated set of core engineering courses that include engineering thermodynamics, conservation laws, reaction kinetics and engineering,unit operations theory and practice, process dynamics, fluid mechanics, and heat and mass transport. The curriculum culminates in a capstone design project, and includes a year-long laboratory that introduces students to classical and modern aspects of chemical engineering operations.

The undergraduate program leads to a Bachelor of Science in Chemical and Biomolecular Engineering and is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Program Educational Objectives

The Program Educational Objectives of the undergraduate CBE major are:

- PEO 1: creatively apply their knowledge and skills to a broad range of contemporary pursuits, taking into account industrial, environmental, economic, safety, global, diversity, and ethical considerations
- PEO 2: apply their technical, communication, and problem-solving skills to the pursuit of careers in the chemical, biochemical, energy and related industries or
- PEO 3: pursue advanced study in graduate programs in chemical engineering and related fields, and in professional programs such as medicine, business, and law
- PEO 4: work both independently and collaboratively to manage complex technical projects
- PEO 5: provide innovation, leadership, and inspiration in their chosen field, continually augmenting their understanding and expertise through formal and informal education

Curriculum

Design is essential to chemical and biomolecular engineering and is incorporated throughout the core courses. Earlier courses emphasize fundamental engineering concepts, while later courses increasingly involve design components and more complex design problems.The senior year introduces a year-long process-design sequence, in which students design chemical and biomolecular processes while considering engineering, safety, environmental and economic constraints.

The chemical and biomolecular engineering major enables graduates to select professional careers from a truly broad spectrum of opportunities. Graduates are prepared for employment in the chemical, pharmaceutical, consumer products, microelectronics, energy, environmental, and related industries, or to enter graduate school.

Undergraduate Advising

All entering freshmen are advised through the Academic Advisement Center. Departmental academic advisers advise sophomores, juniors, seniors and transfer students. Students meet with their academic advisers at least once a semester, coincident with registration for the next term. At this meeting, the adviser discusses the student's work and checks progress towards meeting degree requirements. A graduation checklist must be completed for all students prior to graduation, indicating that all academic requirements have been met.

Requirements for the Bachelor of Science

In addition to the NYU Tandon requirement of a 2.0 GPA or better for graduation, students must also meet the department's academic standards. For chemical and biomolecular engineering students to advance to senior-year, they must maintain a minimum average GPA of 2.5 in courses CBE-UY 2124, CBE-UY 3153, CBE-UY 3313, CBE-UY 3233, CBE-UY 3223 and CBE-UY 3323. The same course must not be failed twice. Students who fail to meet these requirements are not allowed to register for senior courses. All listed prerequisites must be satisfied before students may enroll in CBE courses. In addition, students need a grade of B- or better in their first college level mathematics course (typically MA-UY 1024) for registering into the sophomore course CBE-UY 2124. Should the above requirements not be met, students must meet with their faculty advisor to formulate an individual remedial plan. Typically, one or more courses will need to be retaken until the missing requirement is satisfied, possibly leading to a delayed graduation.

Required Safety Trainings: All sophomore CBE majors must enroll in (on BioRaft) and complete three one-hour training sessions offered by the NYU EHS (Environmental Health and Safety) Office. The three sessions are: Lab

Safety, Waste Management and Biosafety. Student must show proof (e.g. certificate) that they completed this training to their advisors at their next advisement meeting in order to have their registration holds removed. Each subsequent fall they must take three online refresher sessions until they graduate.

Below is a typical sequence of courses taken for the Bachelor of Science in Chemical and Biomolecular Engineering. Adjustments to this sequence can be made for participation in study abroad programs, for transferring credits from other institutions, or for other considerations based on individual circumstances.

Typical Course of Study for the Bachelor of Science in Chemical and Biomolecular Engineering

Freshman Year

Fall Semester: 16 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits* [1]
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*

Spring Semester: 17 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits*
- BMS-UY 1001 Introduction to Cell and Molecular Biology Laboratory *1 Credits*
- BMS-UY 1003 Introduction to Cell and Molecular Biology *3 Credits*
- CBE-UY 1002 Introduction to Chemical and Biomolecular Engineering *2 Credits* [2]
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- CS-UY 1133 Engineering Problem Solving and Programming *3 Credits*

Sophomore Year

Fall Semester: 14 Credits

- PH-UY 1013 Mechanics *3 Credits*
- CM-UY 2213 Organic Chemistry I *3 Credits*
- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- CBE-UY 2124 Analysis of Chemical and Biomolecular Processes *4 Credits*

Spring Semester: 15 Credits

- CM-UY 2614 Physical Chemistry I *4 Credits*
- CM-UY 2223 Organic Chemistry II *3 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*

Junior Year

Fall Semester: 18 Credits

- CM-UY 3334 Biochemistry for Engineers *4 Credits*
- CBE-UY 3153 Chemical and Biomolecular Engineering Thermodynamics *3 Credits*
- CBE-UY 3313 Transport I *3 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Spring Semester: 16 Credits

- CBE-UY 3233 Chemical and Biomolecular Engineering Separations *3 Credits*
- CBE-UY 3223 Kinetics and Reactor Design *3 Credits*
- CBE-UY 3323 Transport II *3 Credits*
- Engineering Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Senior Year

Fall Semester: 16 Credits

- CBE-UY 4113 Engineering Laboratory I *3 Credits*
- CBE-UY 4143 Process Dynamics and Control *3 Credits*
- CBE-UY 4163 Chemical and Biomolecular Process Design I *3 Credits*
- Free Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Spring Semester: 16 Credits

- CBE-UY 4213 Engineering Laboratory II *3 Credits*
- CBE-UY 4173 Polymeric Materials *3 Credits*
- CBE-UY 4263 Chemical and Biomolecular Process Design II *3 Credits*
- Engineering Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Total credits required for graduation: 128

Footnotes

[1] Students who are placed by examination or by an adviser into MA-UY 914 must defer registration for MA-UY 1024.

[2] Students who do not take CBE-UY 1002 (or another 2 credit introductory engineering course) can replace it with two additional credits of engineering electives.

[3] The requirements for Humanities and Social Sciences electives are described in the Undergraduate Academic Programs and Policies section of this catalog.

Note: TRANSFER STUDENTS may substitute 3 credits of engineering electives in place of EG-UY 1003. In addition, they are not required to complete EG-UY 1001.

Chemical Engineering

Academic Adviser: Jovan Mijovic

Graduate Programs in Chemical Engineering

Chemical engineering graduate programs introduce advanced designs, research and development. The department offers graduate programs leading to a Master of Science in Chemical Engineering and Doctor of Philosophy in Chemical Engineering. A BS degree in chemical engineering or a related field of engineering is generally required for admission to graduate study. An applicant who has earned a bachelor's degree from a foreign institution must submit Graduate Record Examination and TOEFL scores. Students with non-chemical engineering backgrounds are strongly encouraged to take a few chemical engineering undergraduate courses at Tandon in order to be prepared for our graduate coursework. Students must have had at least one course in differential equations. NYU Tandon research areas include biopolymers at interfaces, bio-sensors, dynamics of complex fluids, nanotechnology and nanomaterials, process-systems engineering, protein engineering and biomolecular diagnostics.

Goals and Objectives

The objective of the MS degree in chemical engineering is to provide an understanding of the fundamental principles of chemical engineering subjects. The program enhances mathematical and analytical skills and emphasizes advanced design concepts. Students in the MS program develop a deeper understanding of engineering principles, and laboratory and research skills. They also conduct an in-depth study of a specialized chemical engineering topic through a guided studies project or a research thesis.

The PhD degree in chemical engineering provides advanced knowledge of fundamentals and research in emerging fields in chemical engineering. Research skills are refined, and the candidate performs original research that advances the understanding of a specific chemical engineering discipline. Faculty plan programs of study individually with each candidate. Systematic study toward a doctorate is guided by a guidance committee appointed by the Office of Research and PhD Programs.

Master of Science

Chemical Engineering, Guided Studies Option, M.S.

Requirements for the Master of Science in Chemical Engineering

Candidates for the MS in Chemical Engineering should plan their programs in accordance with the following list of requirements:

Guided Studies Option

- CBE-GY 902X Guided Studies in Chemical Engineering *3 Credits each, 6 Credits total*

Required (core) courses, 12 credits, 3 credits each

- CBE-GY 6153 Applied Mathematics in Engineering *3 Credits*
- CBE-GY 6333 Transport Phenomena *3 Credits*
- CBE-GY 6733 Chemical Engineering Thermodynamics *3 Credits*
- CBE-GY 6813 Chemical Reactor Analysis and Design *3 Credits*

Electives: 12 Credits

At least two electives (6 credits) must be chosen from approved CBE graduate courses, 6000-level and above, while the other two (6 credits) may be chosen from other graduate programs with the approval of the graduate adviser in chemical engineering.

Total: 30 Credits

Note:

To meet graduation requirements, students must have an overall B average in all courses (excluding MS Thesis or Guided Study Project) and must not obtain more than two grades of C in required subjects.

Chemical Engineering, Thesis Option, M.S.

Requirements for the Master of Science in Chemical Engineering

Candidates for the MS in Chemical Engineering should plan their programs in accordance with the following list of requirements:

Thesis Option

- CBE-GY 997X MS Thesis in Chemical & Biological Engineering *(9 credits total, 3 each) Credits*

Required (core) courses, 12 credits, 3 credits each

- CBE-GY 6153 Applied Mathematics in Engineering *3 Credits*
- CBE-GY 6333 Transport Phenomena *3 Credits*
- CBE-GY 6733 Chemical Engineering Thermodynamics *3 Credits*
- CBE-GY 6813 Chemical Reactor Analysis and Design *3 Credits*

Electives: 9 Credits

At least two electives (6 credits) must be chosen from approved CBE graduate courses, 6000-level and above, while the other one (3 credits) may be chosen from other graduate programs with the approval of the graduate adviser in chemical engineering.

Total: 30 Credits

Note:

To meet graduation requirements, students must have an overall B average in all courses (excluding MS Thesis or Guided Study Project) and must not obtain more than two grades of C in required subjects.

Doctor of Philosophy

Chemical Engineering, Ph.D.

Requirements for the Doctor of Philosophy in Chemical Engineering

Each doctoral candidate must complete a minimum of 75 credits of academic work past the bachelor's degree, including a minimum of 36 credits of dissertation research, to complete the PhD in Chemical Engineering program. A minimum of 30 graduate credits beyond the bachelor's degree (not including PhD dissertation and non-dissertation research credits) are required in chemical engineering or related subjects. Of the 30 credits, 12 are to be taken as part of the required graduate core courses in Chemical Engineering and 18 are taken as electives. For electives: at least 3 electives (9 credits) are to be chosen from approved CBE courses, 6000-level and above. The remaining electives need to be selected in consultation with and with the explicit approval from the chemical engineering graduate adviser. In addition to the required coursework, attendance is required at departmental colloquia.

Students must also pass a comprehensive qualifying examination in chemical engineering and present a doctoral dissertation. The qualifying exam is given once a year. Additional details on the qualifying examination will be provided by the graduate adviser.

To meet graduation requirements, students must have an overall GPA of 3.0 or higher, excluding dissertation credits, and must not obtain a grade of C or lower in more than two required core courses.

A student who has earned graduate level credits and/or been awarded an MS degree should consult with the graduate adviser for course registration and possible credit transfer.

Candidates for the degree Doctor of Philosophy in Chemical Engineering should plan their programs in accordance with the following requirements:

Required Subjects: 12 credits, 3 credits each

- CBE-GY 6153 Applied Mathematics in Engineering *3 Credits*
- CBE-GY 6333 Transport Phenomena *3 Credits*
- CBE-GY 6733 Chemical Engineering Thermodynamics *3 Credits*
- CBE-GY 6813 Chemical Reactor Analysis and Design *3 Credits*
- CBE-GY 9910 Colloquium in Chemical and Biomolecular Engineering *0 Credits* *
- CBE-GY 9920 Colloquium in Chemical and Biomolecular Engineering *0 Credits* *

Electives: 18 Credits

At least three electives (9 credits) must be chosen from approved CBE courses, 6000-level and above.

The remaining courses may be chosen from other graduate programs with the approval of the graduate adviser in chemical engineering.

Dissertation: 36 Credits

- CBE-GY 999X PhD Dissertation in Chemical & Biological Engineering *36 Credits total, each 3 Credits*

Note:

Up to 9 credits of CBE-GY 998X Research in Chemical & Biomolecular Engineering can be included here.

Total: 75 Credits

Additional Requirements:

- **Required safety training:** All graduate students in PhD Chemical Engineering must enroll in (on BioRaft) and complete three one-hour training sessions offered by the NYU EHS (Environmental Health and Safety) Office in the first semester. The three sessions are: Lab Safety, Waste Management and Biosafety. Student must show proof (e.g. certificate) that they completed this training to their advisors. Each subsequent fall they must take three online refresher sessions until they graduate.
- CBE-GY 9910/CBE-GY 9920 must be taken each semester.

Materials Chemistry

NYU Tandon offers a Doctorate in Materials Chemistry .

Doctor of Philosophy

Materials Chemistry, Ph.D.

Requirements for the Doctor of Philosophy

Each doctoral candidate must complete a minimum of 75 credits of academic work past the bachelor's degree, including a minimum of 36 credits of dissertation research, to complete the PhD in Materials Chemistry program. A minimum of 30 graduate credits beyond the bachelor's degree (not including PhD dissertation and non-dissertation research credits) are required in chemistry or related subjects. Of the 30 credits, 12 are to be taken as part of the required graduate core courses in Materials Chemistry, 6 are from student seminars and a chemical information course, and 12 are taken as electives. For electives: at least 2 electives (6 credits) are to be chosen from approved CM courses, 6000-level and above. The remaining electives need to be selected in consultation with and with an explicit approval from the materials chemistry graduate adviser. In addition to the required coursework, attendance is required at departmental colloquia.

Students must also pass a comprehensive qualifying examination in materials chemistry and present a doctoral dissertation. The qualifying exam is given once a year. Additional details on the qualifying examination will be provided by the graduate adviser.

To meet graduation requirements, students must have an overall GPA of 3.0 or higher, excluding dissertation credits, and must not obtain a grade of C or lower in more than two required core courses.

A student who has earned graduate level credits and/or been awarded an MS degree should consult with the graduate adviser for course registration and possible credit transfer.

Candidates for the degree Doctor of Philosophy in Materials Chemistry should plan their programs in accordance with the following requirements:

Required Core Subjects: 12 credits, 3 credits each

- CM-GY 7043 Statistical Thermodynamics and Kinetics *3 Credits*
- CM-GY 9033 Physical Organic Chemistry *3 Credits*
- CM-GY 8023 Principles of Spectroscopy *3 Credits* OR CM-GY 8073 Organic Spectroscopy *3 Credits*
- CM-GY 6013 Advanced Inorganic Chemistry *3 Credits* OR CM-GY 9413 Biochemistry I *3 Credits* OR CM-GY 7723 Synthesis of Macromolecules *3 Credits*

Other Required Subjects: 6 credits, 1.5 credits each

- CM-GY 9731 Seminar in Chemistry I *1.5 Credits*
- CM-GY 9741 Seminar in Chemistry II *1.5 Credits*
- CM-GY 9751 Seminar in Chemistry III *1.5 Credits*
- CM-GY 5021 Information Sources for the Chemical Sciences *1.5 Credits*

Electives: 12 Credits

At least two electives (6 credits) must be chosen from approved CM courses, 6000-level and above.

The remaining courses may be chosen from other graduate programs with the approval of the graduate adviser in Materials Chemistry.

Dissertation: 36 Credits

- CM-GY 999X PhD Dissertation in Materials Chemistry *36 Total Credits*

Note:

Up to 9 credits of CM-GY 998X Research in Materials Chemistry can be included here.

Total: 75 Credits

Additional Requirements:

- **Required safety training:** All graduate students in PhD Materials Chemistry must enroll in (on BioRaft) and complete three one-hour training sessions offered by the NYU EHS (Environmental Health and Safety) Office in the first semester. The three sessions are: Lab Safety, Waste Management and Biosafety. Student must show proof (e.g. certificate) that they completed this training to their advisors. Each subsequent fall they must take three online refresher sessions until they graduate.
- CM-GY 9710 Chemical Colloquium *0 Credits* must be taken each semester.

Department of Civil and Urban Engineering

Chair: Magued G. Iskander

Mission Statement

The mission of the Department of Civil and Urban Engineering is to produce graduates capable of contributing to and advancing the practice of civil engineering and its sub-disciplines.

The Department

The Department of Civil and Urban Engineering mission involves its faculty in a wide variety of state-of-the-art research and in the development of innovative curricula for the civil engineers of the 21st century.

Research is focused on developing and implementing intelligent infrastructure-monitoring technologies, including smart materials, and optimizing infrastructure system planning, design, operation and management. Sustainability is a critical objective function and overarching theme.

Through the department's involvement in local, regional and national issues, students are exposed to a daily laboratory of infrastructure issues and projects all around them. The department participates in four major interdisciplinary research centers: The Urban Infrastructure Institute, the Urban Utilities Institute, the Transportation Research Institute and the Urban Security Initiative. Department research covers a broad range of topics, including highway capacity and level of service, remote monitoring of infrastructure elements and use, management of urban utilities, intelligent transportation systems technologies, construction materials properties and monitoring, urban infrastructure security and construction operations.

Faculty members teach undergraduate and graduate courses. The curriculum exposes students to instructors in the forefront of their fields; men and women who frequently work on projects and topics of current interest, often within the region. The full-time faculty is augmented by excellent adjunct faculty who teach specialty courses in areas of their expertise, bringing a strong practical element to the classroom.

Programs are well-rounded and balanced. They combine all necessary theoretical elements with a strong emphasis on design and application. Graduates are well-versed in state-of-the-art techniques and develop the skills needed to become leaders in the profession. Among these skills are the ability to communicate effectively in oral and written form and the ability to understand the context of civil engineering projects in a complex society.

Contact Information

NYU Tandon School of Engineering
Six MetroTech Center
Brooklyn, NY 11201
Tel: (646) 997-3223
Web: https://engineering.nyu.edu/academics/departments/civil-and-urban-engineering

Civil Engineering Profession

Civil engineers are responsible for planning, designing, constructing, maintaining and operating today's infrastructure. These areas cover a wide range of urban and regional systems and functions, including buildings, roads, bridges, airports, rail systems, dams, irrigation systems, water supply systems, environmental ecosystems and solid- and liquid-waste treatment and disposal systems and processes. The civil engineer practices in a broad and exciting field with a major impact on society in general and on its infrastructure environment in particular.

Modern civil engineering also deals with rapidly expanding information technologies. These technologies monitor, control, operate and manage complex infrastructure systems. From smart buildings to remote monitoring of transportation, water supply, sewage and other infrastructures, the modern civil engineer applies information technologies to improve the quality of the infrastructure environment.

Degree Programs

The department's undergraduate programs deliver a broad civil-engineering background to the engineer beginning a professional career. Graduate programs allow students to specialize in particular areas or sub-disciplines and to pursue general graduate work across several different areas. The department offers the following degree and certificate programs:

Bachelor of Science

- Civil Engineering, B.S. offered by the Civil Engineering Program
- Construction Management, B.S. offered by the Construction Management Program

Undergraduate Minors

- Construction Management Minor
- Transportation Minor
- Urban Informatics Minor

Master of Science

- Civil Engineering, M.S. offered by the Civil Engineering Program
- Construction Management, M.S. offered by the Construction Management Program
- Environmental Engineering, M.S. offered by the Environmental Engineering and Science Program
- Environmental Science, M.S. offered by the Environmental Engineering and Science Program
- Transportation Management, M.S. offered by the Transportation Program
- Transportation Planning and Engineering, M.S. offered by the Transportation Program
- Urban Infrastructure Systems, M.S. offered by the Urban Infrastructure Systems Program

Doctor of Philosophy

- Civil Engineering, Ph.D. offered by the Civil Engineering Program
- Transportation Planning and Engineering, Ph.D. offered by the Transportation Program

Advanced Certificates

- Construction Management Advanced Certificate*
- Executive Construction Management (Exec 21) Advanced Certificate
- Traffic Engineering Advanced Certificate
- Transportation Management Advanced Certificate
- Transportation Planning Advanced Certificate

**Offered in conjunction with the Department of Management*

Faculty

Professors

John C. Falcocchio, PE, Professor of Transportation Planning and Engineering, Executive Director of the Urban Intelligent Transportation Systems Center
PhD, Polytechnic Institute of Brooklyn
Travel demand forecasting, transportation system evaluation, planning and management

Fletcher H. (Bud) Griffis, F.ASCE, PE, Professor of Civil Engineering, Construction Management Program Director, Director of Center for Construction Management Technology
PhD, Oklahoma State University
Building Information Modeling (BIM), model-based simulation, applications of operations research principles to construction, magnetic levitation (Maglev) transportation systems, dredging and dredged material disposal, infrastructure design, construction and management, engineering economics

Michael Horodniceanu, Professor & Chair the Institute of Construction Innovations
PhD, NYU Tandon School of Engineering
Engaging stakeholders across the construction industry, including developers, designers, contractors, and government officials, in formulating new approaches to the construction challenges

Magued G. Iskander, F.ASCE, PE, Department Chair and Professor of Civil Engineering
PhD, University of Texas at Austin
Foundation engineering, modeling soil structure interaction and flow using transparent soils, long term behavior of sustrainable piling made of recycled polymers, marine geotechnology, pile foundations, alternative foundations, geotechnical instrumentation and monitoring

llan Juran, Professor of Civil Engineering, Executive Director of Urban Infrastructure Institute, Director of the Urban Utilities Center
PhD, DSc, University of Paris IV, École Nationale de Ponts et Chaussées (France)
Geotechnical engineering, soil improvement technologies, geosynthesis engineering, in-situ soil testing, urban systems engineering and management

Samer Madanat, Global Network Professor of Engineering; Dean of Engineering, NYUAD
PhD, Massachusetts Institute of Technology
Transportation infrastructure management

Kaan Ozbay, Professor, Department of Civil and Urban Engineering
PhD, Virginia Polytechnic Institute and State University
Transportation modeling for safety and emergency management operations, real-time traffic control, ITS technology, transportation network organization

Maurizio Porfiri, Professor
PhD, Virginia Polytechnic Institute & State University
Dynamical Systems Theory and Applications, Mechanics of Advanced Materials, Multiphysics Modeling

Industry Professors

Lawrence Chiarelli, F.ASCE, PE, Esq., Industry Professor of Construction Management, Director of Construction Management Program, Associate Director of the Center for Construction Management Technology
JD, Brooklyn Law School
MEng, The Cooper Union
Construction law, risk management, program and construction management; structural engineering and cost estimating

Mohsen Hossein, Industry Professor of Civil Engineering, Coordinator of Graduate Progams in Civil Engineering
PhD, McGill University
Geotechnical engineering, environmental geotechnology, environmental impact assessment

Weihua Jin, Industry Professor
PhD, Columbia University
Sustainable cement-based materials, multi-scale materials mechanics, structural and earthquake engineering

Anne Dudek Ronan, PE, Industry Professor of Civil Engineering
PhD, Stanford University
Water resources engineering, groundwater flow and transport modeling, numerical modeling uncertainty, climate adaptation

José M. Ulerio, Industry Professor of Transportation Engineering
MS, Polytechnic University
Transportation and traffic engineering; collection, handling and analysis of large-scale transportation data bases; highway capacity and quality of service analysis; travel demand forecasting; geometric design of highways

Associate Professors

Masoud Ghandehari, Associate Professor of Civil Engineering
PhD, Northwestern University
Mechanics of fracture, durability of concrete structures, structural materials

Nikhil Gupta, Associate Professor
PhD, Louisiana State University
Multifunctional micro and nano-composites materials, Additive manufacturing, Sensing of damage and structural health monitoring

Debra Laefer, Associate Professor
PhD, University of Illinois at Urbana-Champaign
Geotechnical and structural engineering

Elena S. Prassas, Associate Professor of Transportation Engineering, Director of Transportation Programs
PhD, Polytechnic University
Traffic engineering, software systems and simulation for transportation applications, transportation economics, AI application

Assistant Professors

Joseph Chow, Assistant Professor and Deputy Director of C2SMART
PhD, University of California, Irvine
Transportation systems, multimodal networks, behavioral urban logistics, smart cities, transport economics

Semiha Ergan, Assistant Professor
PhD, Carnegie Mellon University
IT to support design, construction and operations of civil infrastructure systems, urban challenges for AEC/FM

Chen Feng, Assistant Professor
PhD, University of Michigan
Robotic vision and robotics for construction and civil engineering

Said Jabari, Assistant Professor
PhD, University of Minnesota Twin Cities
Traffic flow theory and dynamical modeling, real-time traffic analytics, network flows and sensor placement problems, applied probability and uncertainty quantification

Li Jin, Assistant Professor
PhD, Massachusetts Institute of Technology
Resilient operations of smart transportation systems

Constantine E. Kontokosta, Assistant Professor of Urban Informatics
PhD, Columbia University
Intersection or urban planning, data science, and systems engineering

Andrea Silverman, Assistant Professor
PhD, University of California, Berkeley
Detection and control of waterborne pathogens, wastewater and fecal sludge treatment for reuse, natural disinfection mechanisms

Cassandra Thiel, Assistant Professor
PhD, University of Pittsburgh
Systematically measuring and analyzing environmental inefficiencies in medical services

Industry Assistant Professor

Jack Bringardner, Industry Assistant Professor
PhD, The University of Texas at Austin
Smart Cities Technology, Transportation

Research Faculty

Stephan Bless, Research Professor
ScD, Massachusetts Institute of Technology
Granular mechanics, soil structure interaction, ballistics

Senior Lecturer

Roula Maloof, Senior Lecturer of Civil Engineering
PhD, Polytechnic Institute of New York
Non-destructive evaluation, fracture mechanics, finite element analysis, stress analysis

Adjunct Lecturers

Construction Management and Engineering

Peter Amato, Adjunct Lecturer of Civil Engineering
MS, John Jay College
President, Site Safety, LLC

Ralph D. Amicucci, CCIM, CPM, Adjunct Lecturer of Civil Engineering
MS, New York University
MBA, Iona College

Pooyan Aslani, Adjunct Lecturer of Civil Engineering
PhD, Polytechnic University
Resource-constrained scheduling, building information modeling (BIM), risk analysis

Andrew J. Bates, Adjunct Lecturer of Construction Management, USAF Ret.
PhD, Polytechnic Institute of NYU
Strategic planning and construction operations, risk analysis, statics

Anthony F. Caletka, PE, CCM, CFCC, Adjunct Lecturer of Civil Engineering
BS, Syracuse University
Managing Director, Capital Projects & Infrastructure, PricewaterhouseCoopers

John F. Caruso, Adjunct Lecturer of Civil Engineering
BS, City College of New York
Principal, John F. Caruso Consultant

Salvatore Castelli, Adjunct Lecturer of Civil Engineering
MS, Manhattan College
Project Manager, G.S. Engineering, P.C.

March W. Chadwick, AIA, LEED AP
M.Arch., Georgia Institute of Technology
Principal, M.Arch Architects

Frank DarConte, Research Professor
PhD, NYU Tandon
Vice President, The DeMatteis Organizations

Omar Elsherief, PE
PhD, Polytechnic University
President, Structuretech Engineering

Dominick J. Fickeria, Adjunct Lecturer of Civil Engineering
MS, Manhattan College
Vice President, Director of Construction Management, URS Corp.

Robert N. Harvey, PE, Adjunct Lecturer of Civil Engineering
MS, Massachusetts Institute of Technology
Executive Director, Lower Manhattan Construction Command Center

Omar Khair-Eldin, PE
CE, Columbia Unversity
Senior Supervising Engineer, Parsons PTG Engineers

Robert Maffia, PE, Adjunct Lecturer of Civil Engineering
MBA, Columbia University
Senior Director, Construction Management, Real Estate Development and Facilities, NYU Langone Medical Center

Michael P. Meehan, Adjunct Lecturer of Civil Engineering
MS, New York Institute of Technology
Consolidated Edison Company of New York (Ret.)

Lewis Mintzer, Adjunct Lecturer of Civil Engineering
MBA, Pace University
Director of Marketing, URS Corp.

Robert Otruba, PE, Adjunct Lecturer of Civil Engineering
BS, Syracuse University
University Director, Forensic and Litigation Consulting, FTI

Ronald J. Pennella, Adjunct Lecturer of Civil Engineering
MS, Polytechnic University
Project Executive, StructureTone Inc.

Patrick Prancl, PE, Adjunct Lecturer of Civil Engineering
PhD, City University of New York
Project Manager, El Sol Contracting and Construction Corp.

Salvador Rozenberg, RPA, Adjunct Lecturer of Civil Engineering
EMBA, University of New Haven
Principal, Transaction Maintenance Company

Joel Sciascia, Esq., Adjunct Lecturer of Civil Engineering,
JD, Fordham Law School
MS, Arizona State University, Del Webb
School of Construction General Counsel, Pavarini McGovern LLC

Jeffrey S. Seigel, Esq., Adjunct Lecturer of Civil Engineering
JD, Pace University School of Law
Director Business Development and Marketing, Pavarini/StructureTone

Jerome White, PE, Adjunct Lecturer of Civil Engineering
BS, Polytechnic University
President, Jerome B. White PC

James Vandezande, AIA, Adjunct Lecturer of Civil Engineering
BS, New York Institute of Technology
Senior Associate, HOK

Exec 21 Program in Construction Management

Mark A. Bloom, Esq., Adjunct Lecturer of Civil Engineering
JD, Fordham University School of Law
Partner, Arent Fox LLP

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Principal, Weidlinger Associates

Peter M. Chorman, AIA, LEED AP, Adjunct Lecturer of Civil Engineering
BS, New York Institute of Technology
Vice President, Jones Lang LaSalle America's, Inc.

Joseph M. Giglio, Adjunct Professor of Civil Engineering
PhD, Northeastern University
Senior Academic Specialist; Executive Professor of General Management Northeastern University Vice-chairman, Hudson Institute

Francis J. Lombardi, PE, Adjunct Lecturer of Civil Engineering
MS, Columbia University
Chief Engineer, Port Authority of New York and New Jersey (Ret.)

John E. Osborne, Esq., Adjunct Lecturer of Civil Engineering
JD, University of South Carolina Law Center
Partner, John E. Osborne, PC

Raymond R. Savino, Adjunct Lecturer of Civil Engineering
MBA, Bernard Baruch College
Chief Financial Officer, The DeMatteis Organizations

Luis M. Tormenta, PE, Adjunct Lecturer of Civil Engineering
BCE, Manhattan College
Vice-chairman and Chief Executive Officer, LiRo Group

Louis A. Tucciarone, Adjunct Lecturer of Civil Engineering
MSCE, University of California at Berkeley
Senior Vice-President, URS Corp.

Lou Venech, Adjunct Lecturer of Civil Engineering
BA, Columbia College
General Manager, Transportation Policy & Planning, Port Authority of New York and New Jersey

Environmental and Water Resources Engineering

Mahmoud Ahmed, Adjunct Professor
PhD, Polytechnic Institute of New York University
Project Engineer, New York State DOT

Roy Messaros, Adjunct Professor
PhD, Stevens Institute of Technology
US Army Corps of Engineers

Joon Om, Adjunct Lecturer of Civil Engineering
PhD, Polytechnic University

Haralambos V. Vasiliadis, PE, DEE, D.WRE, CIH, Adjunct Professor
PhD, Polytechnic University
Senior Civil and Environmental Engineer and Technical Advisor, EPM

Dan Westervelt, Adjunct Professor
PhD, Carnegie Mellon University

Structural and Geotechnical Engineering

Walid Aboumoussa, PE, Adjunct Professor of Civil Engineering
PhD, Polytechnic Institute of NYU
Partner, Antonucci & Associates, Architects & Engineers, LLP

J. Jong Lou, PE, Adjunct Professor of Civil Engineering
PhD, Northwestern University
President, J.J. Lou Associates LLPC

Alfonso Whu, Adjunct Lecturer of Civil Engineering
MS, Polytechnic University

Transportation and Highway Engineering

Andrew Bata, Adjunct Professor of Civil Engineering
MS, Northwestern University
New York City Transit Authority

Philip A. Habib, PE, Adjunct Professor of Transportation Engineering
PhD, Polytechnic Institute of New York
President, Philip A. Habib Associates

Michael Horodniceanu, PE, Adjunct Professor of Transportation Engineering
PhD, Polytechnic Institute of New York
President, MTA Capital Construction Company

Richard Malchow, Adjunct Professor of Transportation Engineering
MS, Union College
Vice President, Management and Budget, Urbitran Associates

Raman Patel, Adjunct Professor of Transportation Engineering
PhD, Polytechnic University

Genaro Sansone, Adjunct Lecturer of Transportation Engineering
MBA, Iona College
New York City Transit Authority

Faculty Emeriti

Alvin S. Goodman, PE, Professor Emeritus
PhD, New York University

Roger P. Roess, Professor Emeritus
PhD, Polytechnic Institute of Brooklyn

Non-Degree

Environmental Engineering Minor

Environmental engineers play an important role in designing and implementing projects that protect public health and ecosystems, and therefore play an important societal role in our highly impacted and changing world. The goal of the Civil and Urban Engineering undergraduate minor in Environmental Engineering is to expose undergraduate students to the fundamental principles of environmental engineering theory and practice, which can be applied to solving practical problems that involve evaluation and treatment of contaminated water, soils, and air. Students will develop knowledge and skills in mass and energy balances, reactor models, unit treatment processes, environmental chemistry and microbiology, water resource engineering, hydrology, and environmental contaminants. These skills, along with an emphasis on building analytical reasoning and critical thinking capabilities, can be applied to problem-solving in environmental engineering or additional engineering domains. Students are required to take a total of 15 credits.

The minor is open to all undergraduate students. BS CE students are expected to be able to complete the minor within the required 129 credits.

Learning Objectives of the Environmental Engineering Minor:

- Introduce students to the field of environmental engineering.
- Build foundational skills in mass and energy balances, reactor models, unit treatment processes, environmental chemistry and microbiology, water resource engineering, and hydrology.
- Understand current environmental challenges and environmental health risks, on local and global scales.
- Apply science and engineering principles, and knowledge of environmental regulations, to evaluate current issues in water, soil and air pollution.
- Analyze major unit processes in water, soil, and air treatment systems, and design unit operations to mitigate contaminants in the environment.
- Quantify fluid flow and contaminant transport in the natural environment.
- Enhance problem-solving capabilities and analytical reasoning skills.

Course Requirements

Minor Prerequisites:

- CE-UY 2213 Fluid Mechanics and Hydraulics *3 Credits* (or CBE-UY 3313 or ME-UY 3313 or equivalent)*
- CM-UY 1004 General Chemistry for Engineers *4 Credits* (or CM-UY 1014 or CHEM-UA125 or equivalent)*

Core Courses:

- CE-UY 3223 Introduction to Environmental Engineering *3 Credits* *
- CE-UY 3233 Environmental Engineering Process Design *3 Credits*
- CE-UY 3243 Water Resources Engineering *3 Credits* *
  *CE students currently take these courses as part of their major.

Electives (take two courses from the lists below):

Undergraduate electives:

- CE-UY 3253 Environmental Chemistry and Microbiology *3 Credits*
- CE-UY 4213 Green Infrastructure Design *3 Credits*

Note

Graduate environmental engineering courses may be substituted for the above electives for students with a cumulative GPA> 3.0 with the approval of both the undergraduate academic adviser and the environmental engineering graduate program adviser.

In order for the Minor to be awarded and recorded on the official student transcript, the student has to obtain an overall 2.00 GPA in the Minor courses.

NYU Catalog description of a "Minor"

A minor is an approved coherent concentration of academic study within a single discipline. In specified programs, undergraduate students may select a minor in a field distinct from or related to their major, with approval of advisers in both the major and minor fields. The name of the minor will appear on students' trasncripts if the approved 15 credits in the minor field have been completed with at least a 2.0 GPA. With the consent of a student's major department, some of the courses used to satisfy the minor requirements may also satisfy the required or electives course requirements in the student's major program.

Structural Engineering Minor

Structural engineering is one of the oldest recognized specializations within the civil engineering profession. Buildings, bridges, dams and tunnels are only a few examples of structures upon which our infrastructure is dependent. Structural engineers must have a strong understanding and be capable of both analyzing and designing structural elements and systems. This minor will prepare civil engineering students who intend to pursue a career in structural engineering, as well provide other students a foundation of understanding of structures or a platform from which to pursue further study. Students are required to take a total of 15 credits.

The minor is open to all undergraduate students. BS CE students are expected to be able to complete the minor within the required 129 credits.

Learning Objectives of the Structural Engineering Minor:
• Introduce students to the field of structural engineering.
• Apply science and engineering principles, to analyze and design safe structures
• Ensure all regulations are properly met.
• Ability to use the techniques and modern engineering tools necessary for engineering practice.

Prerequisites

- CE-UY 2133 Engineering Mechanics *3 Credits* *
- CE-UY 2143 Analysis of Determinate Structures *3 Credits* *
- CE-UY 3183 Structural Engineering *3 Credits* *

Core

- CE-UY 3163 Materials for the Built Environment *3 Credits*
- CE-UY 4813 Structural Engineering Capstone *2 Credits* ‡

Select three Electives:

- CE-UY 3123 Dynamics of Extreme Events *3 Credits* †
- CE-UY 3133 Structural Analysis *3 Credits*
- CE-UY 4183 Reinforced Concrete Design *3 Credits* §
- CE-UY 3143 Steel Design *3 Credits* §

- CE-UY 4193 Timber and Masonry Structures *3 Credits*
- CE-UY 4173 Foundation Engineering *3 Credits*

Notes

a. Courses denoted with (*) are taken by all CE students and do not count towards the minor for the CE Students
b. At least one design course denoted with (§) is required.
c. Courses denoted with (†) are required for non-CE Students only
d. Structural Design Capstone (‡) can be used by CE Students to satisfy Capstone II Requirements

Note: This course requires either Reinforced Concrete Design or Steel Design as a prerequisite

Graduate Courses

Certain graduate courses in strutures are allowed for Senior-level Students with cGPA>3.0 and approval of the Structural Engineering Minor adviser.

NYU Catalog description of a "Minor"

A minor is an approved concentration of academic study within a single discipline. In specified programs, undergraduate students may select a minor in a field distinct from, or related to, their major, with approval of advisers in both the major and minor fields. The name of the minor appears on students' transcripts if the approved 14-15 credits in the minor field have been completed with at least a 2.0 GPA. With the consent of a student's major department, some courses used to satisfy the minor requirements also may satisfy the required or electives course requirements in the student's major program.

Transportation Minor

Transportation systems continue to be the main driving force behind the on-going race towards building smart cities of tomorrow. In fact, transportation systems are being re-invented, re-engineered, and revolutionized at a rate that has never been seen in the history except the time motorized transportation replaced horse and buggy approximately 100 years ago. The purpose of the Civil and Urban Engineering undergraduate minor in Transportation is to open new avenues to NYU's undergraduate students from all disciplines to be involved in these exciting developments in transportation engineering and planning. The main educational goal is to provide students with the necessary foundations to use advanced analytical techniques and to employ emerging publicly available big data sources not only to analyze and evaluate existing transportation systems but also to plan and engineer future systems such as hyperloop and autonomous vehicles. Students will have the opportunity to learn to use advance simulation and spatial data analysis and visualization tools to assess the effects of implementing alternative designs of these emerging transportation systems. The capstone course will be the culminating experience to work on exciting real-world projects with leading industry and agency partners under the guidance of transportation faculty with a wealth of academic and practical experience in transportation engineering and planning. Students involved in this minor will also have the opportunity to work on exciting research projects lead by the newly established USDOT Tier 1 University Transportation Center, C2SMART (http://c2smart.engineering.nyu.edu) Students are required to take a total of five classes.

The minor is open to undergraduate students. Transportation is a multidisciplinary field and undergraduates from other engineering departments, computer science, planners are all welcome to participate in this minor.

Learning Objectives of the Transportation Minor:

- Introduce students to urban transportation planning principles.
- Develop foundational skills for evaluating transportation facilities.
- Enhance data-driven problem-solving capabilities and analytical reasoning skills.
- Understand how new technologies can be applied to addressing urban transportation challenges

Required Courses

- CE-UY 3313 Introduction to Transportation Systems *3 Credits* OR CE-UY 2343 Transportation Engineering *3 Credits*
- CE-UY 4833 Transportation Engineering Capstone *3 Credits*

Electives

Undergraduate Courses

Students may choose any three elective courses from the following:

- CE-UY 3313 Introduction to Transportation Systems *3 Credits*
- CE-UY 2343 Transportation Engineering *3 Credits*
- CE-UY 3303 Traffic Engineering *3 Credits*
- CE-UY 3333 Transportation Systems and Software *3 Credits*
- CE-UY 3363 Transportation Economics *3 Credits*
- CE-UY 3373 Transportation Systems Analytics *3 Credits*
    - Up to one course from outside the CUE department is allowed to count toward these electives, with approval of the Transportation Minor adviser.

Graduate Courses

Certain graduate courses in transportation, as well as courses from CUSP, are allowed for Junior- or Senior-level Students with cGPA>3.0 and approval of the Transportation Minor adviser.

Contact Information

Departmental Adviser: Joseph Chow

joseph.chow@nyu.edu

Urban Informatics Minor

The academic mission of the proposed undergraduate minor in Urban Informatics is to expose undergraduate students from across the University to the emergent field of data-driven urban studies. This includes the application of data acquisition and analytics to understanding the urban environment, infrastructure, operations, management, policy, design, planning, and population health. The goal is to offer students the necessary foundation to acquire and analyze information to solve critical challenges facing cities in the 21st century. Students will develop skills in data acquisition, data management, analysis, and visualization, as well as in data structure and privacy standards.

The minor is open to students across the University, including those in STEM fields, the humanities, the social sciences, and the arts. Given the cross-disciplinary nature of studies of cities, this minor will be of particular interest to students in disciplines such as sociology, public policy, public health, architecture/urban design, business, economics, and politics. Non-engineering students will gain quantitative skills for deeper understanding of cities in disciplinary areas of interest, while engineering students will benefit from specialized technical electives in data analytics. For both groups, the minor provides skills that are needed for data-driven analysis and critical thinking. This course of study will help prepare students for graduate study in a range of fields, as well as for work in government, the private sector, and nongovernmental organizations that focus on cities and urban living.

Learning Objectives of the Urban Informatics Minor:

- Introduce students to the emerging fields of urban informatics and data science in the context of urban studies.
- Build foundational skills in data modeling, data manipulation, analysis, and visualization.
- Introduce students the applicable data standards for data representation and reasoning.
- Develop computing skills to enable future advanced studies in data applications to engineering.
- Enhance data-driven problem-solving capabilities and analytical reasoning skills.
- Understand how sensing technologies can be applied to better understand urban challenges, including city management and planning, and emergency response.

In consultation and approval of the designated minor advisor, students will select from the following options:

Prerequisite

- MA-UY 2224 Data Analysis *4 Credits* (or equivalent)

Core Course

- CE-UY 4443 Sensing the City: Methods for Urban Health Monitoring *3 Credits*
- CE-UY 4843 Urban and Infrastructure Informatics Capstone *3 Credits*

Electives (Select at least 2 courses)

- CE-UY 3373 Transportation Systems Analytics *3 Credits*
- CE-UY 3123 Dynamics of Extreme Events *3 Credits*
- CS-UY 1134 Data Structures and Algorithms *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
  (Other electives may be used if approved by minor advisor)

Note

In order for the Minor to be awarded and recorded on the official student transcript, the student has to obtain an overall 3.0 GPA in the minor courses.

Contact Information

Minor Advisor: Professor Masoud Ghandehari

masoud@nyu.edu

Civil Engineering

Program Advisers:
José M. Ulerio, Undergraduate
Mohsen Hossein, Graduate

Minor in Construction Management

An undergraduate Construction Management Minor enhances the capability of students who may seek employment in the construction industry or who may be interested in studying Construction Management at the graduate level.

Transfer Students and Credits

Potential transfer students should refer to the Institute guidelines in this catalog. The Department of Civil and Urban Engineering has established additional requirements and interpreted the Institute guidelines as indicated in this section.

The 129-credit curriculum is fulfilled by combining transfer credits, credits by examination and courses taken at NYU Tandon. Transfer credits in mathematics, chemistry, physics, humanities and social sciences are evaluated by the Office of Academic Affairs with faculty guidance from specific departments. Transfer credits in civil engineering and other technical areas are evaluated by the faculty of the Department of Civil and Urban Engineering.

The length of time for a transfer student to complete the BS in Civil Engineering depends upon three factors:

1. The total number of transfer credits awarded;
2. The particular courses required to complete degree requirements; and
3. Enrollment status (part-time or full-time).

Transfer Notes
Transfer students should understand that they can be awarded transfer credits for courses with a C grade or better and then only for courses that are applicable toward the BS in Civil Engineering as described in this catalog.

A residency requirement also must be fulfilled. To earn a BS, a student must complete a minimum of 30 credits at NYU Tandon at the junior or senior level (courses numbered CE 3XXX or CE 4XXX). These credits must include the design project, CE-UY 4814 .

Part-Time Students

Students may register as part-time students (fewer than 12 credits a semester). Such students are advised, however, that the department does not offer many undergraduate courses in the evening and that part-time students must take most courses during the day. Part-time students should maintain close contact with their academic advisers to work out the details of course sequencing efficiently and effectively.

Previous Curricula

It is a generally accepted rule that students are subject to the requirements of the catalog in effect when they enrolled initially at NYU Tandon. In many cases, however, it will be easier to complete the current curriculum. Academic advisers work with students to make sure that they fulfill the proper requirements for graduation.

Bachelor of Science

Civil Engineering, B.S.

Undergraduate Program

The Department of Civil and Urban Engineering develops engineering graduates capable of contributing to and advancing the practice of civil engineering and its subdisciplines. Through its research programs, the department strives to be at the forefront in selected areas in the development of new knowledge and applications in civil engineering. Through its educational programs, graduates will be well rounded in state-of-the-art techniques and will develop the skills needed in a complex profession. Among these skills are the abilities to communicate effectively and to understand the context of civil engineering projects in a complex society.

Program Educational Objectives

Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve. NYU Tandon School of Engineering's undergraduate program in civil engineering is strongly practice-oriented, heavily emphasizing design. The breadth of the core courses prepares students for entry-level positions in any civil engineering subdiscipline or for graduate study; some graduates eventually may work in other professions. Within three to five years of earning undergraduate degrees, graduates will:

1. Apply scientific principles, interdisciplinary knowledge, critical thinking skills, cutting-edge technology, and a passion for civil engineering to solve complex engineering and societal problems.
2. Demonstrate leadership in professional careers, pursue continuous and lifelong learning, and progress towards professional licensure.
3. Communicate and collaborate effectively with industry professionals, decision-makers, and community stakeholders.
4. Work in an ethical and professional manner towards sustainable and resilient civil and urban infrastructure systems.
5. Successfully perform functions of civil engineering practice, including analysis, design, project management, experimentation, interpretation of data, application of new knowledge, and use of sound engineering judgment to draw conclusions.

Student Outcomes

Student outcomes are those abilities and skills that graduates are expected to have upon graduation with a BS in Civil Engineering degree. For these, the Department has adopted the seven fundamental outcomes specified by the Engineering Accreditation Commission of ABET, http://www.abet.org. They cover the full breadth and depth of the abilities and skills needed by modern engineering professionals. They are listed below with brief discussions of how each relates to the civil engineering profession.

1. **An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.** *Virtually all of civil engineering involves the application of mathematics and basic sciences to the solution of real-world infrastructure problems. Fundamental engineering skills evolve directly from science and mathematics. Students are immersed in these applications across all subdisciplines of civil engineering. The program is frequently updated to incorporate the latest approaches to engineering solutions, and to include the use of modern engineering tools. Important "tools" include a variety of computer programs for data analysis, simulation and design. The program is heavily design-oriented. Several courses include full design-project laboratories. Many additional courses have design components, and all students finish their academic programs with a comprehensive civil engineering capstone project.*

2. **An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.** *Engineers do not just solve problems brought to them by others. Engineers must spot problems before they become evident and describe them in terms that expedite their solution. As students progress through the program, they increase their participation in identifying and framing problems, as well as in developing comprehensive solutions.*

3. **An ability to communicate effectively with a range of audiences.** *Engineers do not solve problems in a vacuum. Everything engineering professionals do affects the world around them. In the modern world economy, the "world" includes local neighborhoods, regions, states, nations and, indeed, the world. Solutions must be couched in a firm understanding of the impacts they will have on the environment, the economy and society.Engineers must explain their views and solutions to problems in ways that can be understood clearly by other professionals and by the public. Modern communication involves written and oral forms, and a wide variety of electronic media.*

4. **An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.** *All professionals must be keenly aware of their general and professional ethical responsibilities to society in general, and to others who require and pay for their services. Like many professions, engineers, and civil engineers in particular, have specific ethical codes issued by professional societies with which they must comply. General ethical considerations are discussed throughout the curriculum, and several courses have a strong focus on the basis for, and application of, professional ethical code.*

5. **An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.** *Any significant project involves several engineers, perhaps with different engineering backgrounds, as well as non-engineers (planners, architects, financiers, managers, etc). Students have the opportunity to work in teams in several courses, but particularly in the capstone design project.*

6. **An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.** *Civil engineers must engage in a number of basic experiments, and be aware of how to collect, organize, report and interpret the results of basic experiments and direct field observations of infrastructure operations. In the program, students are exposed to a wide range of laboratory experiments, including experiments in fluid mechanics, material behavior under loading, soil properties and behavior, and others. They also are exposed to the collection of field data related to environmental conditions and problems, highway and street traffic, and the monitoring of structures.*

7. **An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.** *The engineering profession changes rapidly with the technological world. While general principles tend to*

change slowly, the specific materials, analysis techniques and approaches to engineering change quite rapidly. The body of knowledge graduates leaves with must be updated constantly and expanded during their professional lives. The program provides opportunities for students to appreciate this need, and develop useful skills for self-learning, now and in the future.

Curriculum

The undergraduate curriculum for the BS in Civil Engineering provides a solid foundation in all major subdisciplines through required courses. It also requires a concentration in one of five areas (structural engineering, transportation engineering, environmental engineering, urban informatics, or construction management). Table 1 summarizes the curriculum and its requirements in subject-area categories. A typical four-year course of study for civil engineering majors is shown on the full-page chart at the end of this section.

Student have progressive design exposure throughout the curriculum. An introduction to design is provided by EG-UY 1003 in the freshman year. Courses CE-UY 2343, CE-UY 3183, CE-UY 3223, CE-UY 3243, and CE-UY 3153 have subdiscipline-specific design content. Many civil engineering elective courses also have strong design components. All students must complete two capstone design courses (CE-UY 4803 and CE-UY 4813 or CE-UY 4833 or CE-UY 4843 or CE-UY 4853 or CE-UY 4863) during their senior year.

Undergraduate civil engineering elective courses are provided in structural, geotechnical, environmental, water resources and transportation engineering, and construction management and engineering. These allow students to gain significant depth in these areas. Selected students with sufficient gradepoint averages may take graduate courses in these areas. Special topics courses are provided in each major subdiscipline and are offered as needed.

Communication skills are emphasized throughout the curriculum. The humanities and social sciences portions of the curriculum focus strongly on developing writing and oral skills. The freshman engineering program also includes substantial emphasis on oral presentations and written report assignments. All courses with associated laboratories require written laboratory or project reports; many design courses require formal submission of design reports, some with oral presentations. The senior design-project experience includes many oral and written progress reports and is formally presented and defended as part of final submission.

Humanities and social sciences courses also help students to understand the societal context of their profession. CE-UY 1002 and CE-UY 4092 reinforce this understanding with specific civil engineering references and provides a focused treatment of professional ethics. These aspects are also highlighted in other civil-engineering curriculum courses.

Other Requirements

1. After a student completes four semesters or 64 credits at NYU (whichever is earlier), the student must have a combined GPA of at least 2.333 in the following six required CE courses, all of which must be completed by this point: CE-UY 1002 Introduction to Civil Engineering, CE-UY 2133 Engineering Mechanics, CE-UY 2143 Analysis of Determinate Structures, CE-UY 2213 Fluid Mechanics and Hydraulics, CE-UY 2343 Transportation Engineering, and CE-UY 2533 Construction Project Management. If a student has a combined GPA below 2.000 in the above six classes, the student may not be allowed to remain in the major. If a student has a combined GPA of at least 2.000 and below 2.333, the student may be required to re-take at least one of the courses to raise the GPA to 2.333 before being allowed to enroll in some junior-level required CE courses. If the student has not yet completed all six of the courses, the student will be required to enroll in them that semester.
2. Since the capstone design course, CE-UY 4803 Civil Engineering Capstone requires a thorough understanding of all aspects of civil engineering, students registering for the course must have a cumulative GPA of 2.000 or better in all civil engineering courses taken thus far, excluding civil engineering electives.
3. To promote interest in professional registration, students must register for the Fundamentals of Engineering (FE) exam, which is administered by the National Council of Examiners for Engineering and Surveying

(NCEES). In senior year all students are required to register to take the FE Exam and enroll in CE-UY 4990 Fundamentals of Engineering Exam Registration for CUE. In addition, CE-UY 4092 includes a zero-credit recitation that provides preparation for the exam. Students who are not legally eligible to hold a professional engineer's (PE) license are exempt from this requirement, but must still take CE-UY 4092.

Accreditation

The BS in Civil Engineering is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Curriculum

Please see below for the BS in Civil Engineering curriculum.

Table 1: Curriculum for the BS in Civil Engineering

Mathematics: 16 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits* [1]
- MA-UY 1124 Calculus II for Engineers *4 Credits* [1]
- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits* [1]
- MA-UY 2224 Data Analysis *4 Credits* [1]

Sciences: 18 Credits

- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- Science Elective *3 Credits* [2]

General Engineering, Computer Science: 7 Credits

- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*
- CS-UY 1113 Problem Solving and Programming I *3 Credits*

Humanities and Social Science: 24 Credits

- EXPOS-UA 1 Writing the Essay *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- Humanities and Social Sciences Electives *16 Credits* [3]

Civil Engineering: 52 Credits

- CE-UY 1002 Introduction to Civil Engineering *2 Credits*
- CE-UY 2133 Engineering Mechanics *3 Credits*
- CE-UY 2143 Analysis of Determinate Structures *3 Credits*
- CE-UY 2213 Fluid Mechanics and Hydraulics *3 Credits*
- CE-UY 2343 Transportation Engineering *3 Credits*
- CE-UY 2533 Construction Project Management *3 Credits*
- CE-UY 3013 Computing in Civil Engineering *3 Credits*
- CE-UY 3153 Geotechnical Engineering *3 Credits*
- CE-UY 3163 Materials for the Built Environment *3 Credits*
- CE-UY 3183 Structural Engineering *3 Credits*
- CE-UY 3223 Introduction to Environmental Engineering *3 Credits*
- CE-UY 3243 Water Resources Engineering *3 Credits*
- CE-UY 4092 Leadership, Business Principles, Policy and Ethics in Civil Engineering *2 Credits*
- CE-UY 4803 Civil Engineering Capstone *3 Credits*
- CE-UY 48X3 Civil Engineering Concentration Capstone *3 Credits* [4]
- CE-UY 4990 Fundamentals of Engineering Exam Registration for CUE *0 Credits*
- Civil Engineering Electives *9 Credits*

Free Elective: 12 Credits

- Free Elective *12 Credits* [5]

Total Credits for Degree: 129

Footnotes for Table 1

[1] Placement in math classes is based on AP credit and/or placement exams administered by the Mathematics Department.

[2] Students may select a basic science elective from one of the following courses: Introduction to Cell and Molecular Biology, Astronomy and Astrophysics, or Introduction to Geophysics (Geology)

[3] Students must take sixteen credits (four courses) of elective courses in the humanities and social sciences. Consult the Technology, Culture and Society portion of the bulletin for details. At least one humanities and social sciences elective must be a 3xxx/4xxx level course. At least one humanities and social sciences elective must be a writing-intensive course, labeled by "W."

[4] A capstone design course associated with an area of concentration (structural engineering, transportation engineering, environmental engineering, urban informatics, or construction management) is required.

[5] A free elective is any course in any department of the University for which the student has the prerequisites.

Typical Course of Study for the Bachelor of Science in Civil Engineering

Please see below for the Typical Course of Study.

Freshman Year

Fall Semester: 16 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*

Spring Semester: 16 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- CS-UY 1113 Problem Solving and Programming I *3 Credits*
- CE-UY 1002 Introduction to Civil Engineering *2 Credits*

Sophomore Year

Fall Semester: 18 Credits

- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- Humanities and Social Sciences Elective #1 *4 Credits*
- CE-UY 2133 Engineering Mechanics *3 Credits*
- CE-UY 2533 Construction Project Management *3 Credits*

Spring Semester: 17 Credits

- MA-UY 2224 Data Analysis *4 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- CE-UY 2143 Analysis of Determinate Structures *3 Credits*
- CE-UY 2213 Fluid Mechanics and Hydraulics *3 Credits*
- CE-UY 2343 Transportation Engineering *3 Credits*

Junior Year

Fall Semester: 16 Credits

- Humanities and Social Sciences Elective #2 *4 Credits*
- CE-UY 3223 Introduction to Environmental Engineering *3 Credits*
- CE-UY 3183 Structural Engineering *3 Credits*
- CE-UY 3243 Water Resources Engineering *3 Credits*
- CE-UY 3013 Computing in Civil Engineering *3 Credits*

Spring Semester: 15 Credits

- Science Elective *3 Credits*
- CE-UY 3153 Geotechnical Engineering *3 Credits*
- CE-UY 3163 Materials for the Built Environment *3 Credits*
- Civil Engineering Elective #1 *3 Credits*
- Free Elective #1 *3 Credits*

Senior Year

Fall Semester: 15 Credits

- Humanities and Social Sciences Elective #3 *4 Credits*
- Civil Engineering Elective #2 *3 Credits*
- Free Elective #2 *3 Credits*
- CE-UY 4092 Leadership, Business Principles, Policy and Ethics in Civil Engineering *2 Credits*
- CE-UY 4803 Civil Engineering Capstone *3 Credits*

Spring Semester: 16 Credits

- CE-UY 48x3 Civil Engineering Concentration Capstone *3 Credits*
- Civil Engineering Elective #3 *3 Credits*
- Free Elective #3 *3 Credits*
- Free Elective #4 *3 Credits*
- Humanities and Social Sciences Elective #4 *4 Credits*

Total credits required for graduation: 129

Master of Science

Civil Engineering, M.S.

Master of Science Program in Civil Engineering

The Master of Science in Civil Engineering allows students to specialize in one of the following six areas of concentration:

- Construction Management and Engineering
- Structural Engineering
- Geotechnical Engineering
- Environmental and Water Resources Engineering
- Urban Systems Engineering and Management
- Highway and Traffic Engineering

Students also may elect to follow a general program by taking two courses across several areas of concentration. The Department of Civil and Urban Engineering also offers graduate programs in transportation planning and engineering and transportation management (see the Transportation section in this catalog), environmental science and engineering (see Environmental Engineering and Science section in this catalog), construction management and engineering (see the Construction Management section of this catalog), and urban systems engineering and management (see Urban Infrastructure Systems section in this catalog).

Goals and Objectives

The degree MS in Civil Engineering prepares graduates to practice their profession at an advanced level. Specific program objectives are to provide the skills and knowledge necessary to:

- Specialize in one of the primary subdisciplines of civil engineering or to achieve depth across a number of the subdisciplines;
- Design and analyze civil engineering infrastructure;
- Understand civil engineering materials, technologies and processes as applied to modern civil engineering infrastructure;
- Obtain civil engineering project management skills; and
- Provide a basis for continued, lifelong learning in the civil engineering profession.

Admission

Students seeking admission to the MS program should hold a bachelor's degree in civil engineering from a program accredited by the Accreditation Board for Engineering and Technology (ABET) and have a 3.0 GPA or better. Applicants lacking a BS from an ABET-accredited program in civil engineering (including those possessing undergraduate degrees in other engineering disciplines, engineering science, engineering technology and architecture, or from a foreign university) have their qualifications reviewed by a graduate adviser. Admission may be granted and may include the requirement for additional undergraduate courses to correct deficiencies. These additional courses are not counted toward the MS degree, nor are undergraduate courses included in computing graduate grade-point averages.

Applicants to the MS program should take the Graduate Record Examination (GRE Advanced Tests) and achieve a minimum grade of 155 (700 on the previous scale) on the quantitative section. Applicants from universities outside the United States must take the Test of English as a Foreign Language (TOEFL) and achieve a minimum grade of 80.

International candidates who meet all other admission requirements but who fail to satisfy the TOEFL requirement may be required to take remedial courses in English before admission.

Grade Requirements

To earn a MS degree from NYU Tandon School of Engineering, students must maintain a B average (3.0 GPA) or better in (1) all graduate courses taken at NYU Tandon School of Engineering, (2) all graduate courses taken in the Department of Civil Engineering and (3) all graduate guided studies (readings, project, thesis). Poor scholastic performance (under 3.0 GPA) may lead to a student being placed on graduate probation. If a student's grade do not improve, (s)he may be disqualified from further graduate study in the department.

In the event that an applicant is required to take undergraduate prerequisite courses as a condition of admission, a grade of B- or better is required for every prerequisite course taken, and the cumulative GPA of all required prerequisite courses must be at least 3.0.

Advising

Students are responsible for following the departmental rules outlined in this catalog. While academic advisers consult with and advise students, students are responsible for ensuring that all degree requirements are fulfilled and for submitting all proper forms and applications.

Students must meet with an academic adviser when they first enroll. Students must have a detailed program of study formally approved by an academic adviser before registration.

The academic adviser also handles requests for waivers of certain degree requirements, where warranted. Such waivers must be in writing and must be entered into the student's departmental record. Where specific courses are waived, approval of the course instructor may also be required. When waivers are granted, students may be required to take other specific courses in their place or to select additional electives. Students registering for guided studies (readings, projects, theses) are assigned advisers for each such activity. To register for guided study, students must submit written proposals for the topic(s) to be covered to such advisers before registration. To register, students must obtain written approval of the project adviser and the academic adviser.

Transfer Credits

The residency requirement for the MS degree is 24 credits. Students may transfer up to 6 credits of acceptable courses toward a MS degree, subject to their academic adviser's approval. To be transferred, the course(s) must relate to the student's program and be from an accredited institution. A grade of B or better is required for granting of transfer credit. Courses graded on a pass/fail basis are not considered for transfer unless accompanied by a detailed written evaluation by the course instructor. All transfer requests must be accompanied by an official transcript from the transferring institution. Applications for transfer credits must be submitted for consideration before the end of the first semester of matriculation.

Validation credits by examination may not be used toward any civil engineering graduate degree program.

Degree Requirements

All MS (Civil Engineering) students must complete either the single area of concentration or general program requirements as described in Table 3:

Table 3: Avenues for Obtaining MS (Civil Engineering)

Students Selecting a Single Area of Concentration

Core Courses:	12 credits (min.)
Courses Within Concentration:	12 credits (min.)
Technical Electives:	6 credits

Students Selecting the General Program

Core Courses:	12 credits (min.)
Two Courses in each of 3 Concentration Areas:	18 credits (min.)

Credits Required for MS Degree: 30 credits

A. Core Courses: 12 Credits

Students must complete at least four of the following six core courses.

Table 4: Core Courses in Civil Engineering

- CE-GY 6023 Materials for Civil Engineers *3 Credits*
- CE-GY 6073 Instrumentation, Monitoring and Condition Assessment of Civil Infrastructure *3 Credits*
- CE-GY 7673 Environmental Impact Assessment *3 Credits*
- CE-GY 7843 Urban Infrastructure Systems Management *3 Credits*
- CE-GY 8253 Project Management for Construction *3 Credits*
- CE-GY 8283 Risk Analysis *3 Credits*

B. Concentration Area Courses: 12 to 18 Credits

Students selecting a single area of concentration must complete: (1) at least one core course in their concentration area; and (2) at least four additional concentration area courses. The course requirements of various concentration areas are listed in Tables 5-10. All students must satisfy all course prerequisites.

C. Technical Electives: 0 to 6 Credits

Depending upon the choice of concentration area, a student may have up to an additional 6 credits of course work, which may be satisfied from the following:

Electives:

Electives are normally selected from the courses given by the Department of Civil and Urban Engineering. However, electives may be selected from courses offered by other departments with written consent of the graduate adviser.

Project:

- CE-GY 9963 MS Project in Civil & Urban Engineering *3 Credits*

Thesis:

- CE-GY 997X Thesis for MS in Civil Engineering *6 Credits*

Table 5: Geotechnical Engineering Concentration

Select courses from:

- CE-GY 8423 Ground Improvement *3 Credits*
- CE-GY 8663 Advanced Foundation Design *3 Credits*
- CE-GY 8673 Excavation Support Systems *3 Credits*
- CE-GY 8403 Geotechnics and Geomaterials *3 Credits*
- CE-GY 8433 Urban Geotechnology *3 Credits*

- CE-GY 8493 Environmental Geotechnology *3 Credits*
- CE-GY 7233 Groundwater Hydrology and Pollution *3 Credits*
- CE-GY 8603 Selected Topics in Geotechnical Engineering *3 Credits*

Table 6: Structural Engineering Concentration

- CE-GY 6013 Theory of Structural Analysis and Design *3 Credits*
- CE-GY 6163 Finite Element Methods *3 Credits*
- CE-GY 6033 Selected Topics in Structural Analysis I *3 Credits*
- CE-GY 6043 Selected Topics in Structural Analysis II *3 Credits*
- CE-GY 6063 Bridge Engineering *3 Credits*
- CE-GY 6133 Stability of Structures *3 Credits*
- CE-GY 6143 Steel Structures *3 Credits*
- CE-GY 6183 Concrete Structures *3 Credits*
- CE-GY 6193 Wind and Earthquake Engineering *3 Credits*
- CE-GY 6253 Structural Dynamics *3 Credits*
- CE-GY 6263 Analysis and Design of Tall Buildings *3 Credits*

Table 7: Construction Management and Engineering Concentration

Graduate Construction Management and Engineering courses, including Exec 21 courses, are listed in the Construction Management, M.S. section of this catalog.

Table 8: Environmental/Water Resources Engineering Concentration

Select courses from:

- CE-GY 6053 Monitoring Cities *3 Credits*
- CE-GY 7223 Hydrology *3 Credits*
- CE-GY 7233 Groundwater Hydrology and Pollution *3 Credits*
- CE-GY 7373 Environmental Chemistry and Microbiology *3 Credits*
- CE-GY 7423 Water and Wastewater Treatment *3 Credits*
- CE-GY 7353 Selected Topics in Water Resources and Hydraulic Engineering I *3 Credits*
- CE-GY 7393 Advanced Environmental Chemistry and Microbiology *3 Credits*
- CE-GY 7433 Advanced Water and Wastewater Treatment *3 Credits*
- CE-GY 7453 Water and Wastewater Treatment Laboratory *3 Credits*
- CE-GY 7473 Modeling Fate and Transport of Surface Water Pollution *3 Credits*
- CE-GY 7533 Hazardous/Toxic Waste Management *3 Credits*
- CE-GY 7703 Solid Waste Management *3 Credits*
- CE-GY 7753 Environmental Systems Management *3 Credits*
- CE-GY 8493 Environmental Geotechnology *3 Credits*

Table 9: Highway and Traffic Engineering Concentration

Select courses from:

- TR-GY 6013 Fundamental Concepts in Transportation *3 Credits*

- TR-GY 6113 Forecasting Urban Travel Demand *3 Credits*
- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*
- TR-GY 6333 Transportation & Traffic Concepts *3 Credits*
- TR-GY 6343 Traffic Operations & Control *3 Credits*
- TR-GY 7033 Multimodal Transportation Safety *3 Credits*
- TR-GY 7123 Management of Urban Traffic Congestion *3 Credits*
- TR-GY 7323 Design of Parking and Terminal Facilities *3 Credits*
- TR-GY 7343 Urban Freeways and Intercity Highways *3 Credits*

Table 10: Urban Systems Engineering and Management Concentration

Select courses from:

- CE-GY 7813 Infrastructure Planning, Engineering and Economics *3 Credits*
- CE-GY 7853 Infrastructure Asset Management *3 Credits*
- CE-GY 6073 Instrumentation, Monitoring and Condition Assessment of Civil Infrastructure *3 Credits*
- CE-GY 7753 Environmental Systems Management *3 Credits*
- CE-GY 8713 Construction and the Law *3 Credits* *
- CE-GY 8733 Infrastructure Financing: Structuring of a Deal *3 Credits* *
- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*

Footnote

** Students must meet the requirements for enrollment in Exec 21 courses.*

Doctor of Philosophy

Civil Engineering, Ph.D.

Doctoral Program in Civil Engineering

The Department of Civil and Urban Engineering currently offers two doctoral degree programs: PhD in Civil Engineering and PhD in Transportation Planning and Engineering. Requirements for the Civil Engineering degree are detailed here. For information on the Transportation Planning and Engineering program, see the "Transportation" section of this catalog.

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.

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.

Program Adminstration

The Department of Civil and Urban Engineering has five graduate program coordinators:

- Graduate Program Coordinator for Civil Engineering (MS and PhD)
- Graduate Program Coordinator for Environmental Engineering/ Environmental Science (MS)
- Graduate Program Coordinator for Urban Infrastructure Systems (MS)
- Graduate Program Coordinator for Transportation (MS and PhD)
- Graduate Program Coordinator for Construction Management and Engineering (MS)

The graduate coordinators form the departmental Graduate Committee. The Committee reviews all PhD applications and makes admissions decisions, which are implemented by a graduate coordinator. For each registration, the student's program must be approved by the academic adviser and signed by the graduate coordinator.

Admission Criteria

1. Admission to the PhD in Civil Engineering requires an MS in Civil Engineering or equivalent with a GPA of 3.5 or better (on a 0-4 scale).
2. All applicants are required to submit GRE scores for consideration.
3. International applicants must take the TOEFL examination and submit the results for consideration.

In criterion 1 above, the "equivalent" can be achieved in several ways. The candidate may have a MS degree with a different title that covers substantially the same material. In more general terms, the applicant must demonstrate that he or she has the equivalent of all undergraduate and master's-level course work to be able to pursue doctoral-level work in the chosen major area, as well as in a minor area within the umbrella of civil engineering. Further, "equivalence" is evaluated based on the totality of the student's undergraduate and graduate record, not course by course. Thus, an applicant who wishes to pursue doctoral work in Environmental Engineering, for example, must have the entire undergraduate and master's-level course background expected in Environmental Engineering, but need not demonstrate such a background in structures. Because admission to a PhD program requires a relevant MS (or equivalent), an applicant who has not yet earned a master's degree will be admitted as MS student and is expected to earn an MS degree while completing the major and minor course requirements. In rare cases, an applicant with only a BS degree may be directly admitted into the PhD program with the written approval of the department head.

Doctoral Program of Study

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 student's academic adviser plans a program to fulfill major and minor requirements for the PhD degree. The Academic Advisory Committee generally consists of the academic adviser and one faculty member for each 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.

Doctoral Degree Requirements

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

1. 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 0-4 scale). Up to 6 credits of the 54 credits may be satisfied by individual guided studies, readings, projects and theses.
2. 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:
    - CE 9998: Independent original investigation demonstrating creativity and scholarship worthy of publication in a recognized engineering journal. Registration for a minimum of 6 credits is required before registering for CE-GY 999X .
    - CE-GY 999X : 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 per semester is permitted. In the final semester of work, registration for credit is permitted with the approval of the department head. *Prerequisites: CE 9998 (6 credits), degree status, successful completion of doctoral qualifying examinations and approval of the dissertation adviser*.
3. Completion of two minor areas of study, as follows:

- Out of Department Minor: Completion of 9 credits of graduate or undergraduate course work in one or two technical areas of study.
- In-Department Minor: Completion of 6 credits of graduate course work in a minor area outside the major subdiscipline in civil engineering.

4. Residency requirements for the PhD in Civil Engineering include the 21-credit dissertation plus a minimum of 15 credits of applicable graduate course work taken at NYU Polytechnic School of Engineering.
5. In satisfying the 54-credit course requirement (requirement 1), the student must satisfy all requirements for the major and minor areas selected, or their equivalents.
6. In satisfying these basic PhD requirements, students also must satisfy one of the two following conditions:
    a. 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 0-4 scale).
    b. 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 0-4 scale). Satisfying condition 6b requires that the department accept the student's MS degree *in toto* without regard to its specific content. This acceptance requires a recommendation from the department's Graduate Committee and department head approval.
2. 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.

Transfer Credits

A maximum of 39 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.

Qualifying Examination

A student must register for RE-GY 9990 PhD Qualifying Exam in the semester in which the qualifying exam will be taken. This course carries no credit, and the student incurs no fees. It provides a place in the student's official transcript to record when the qualifying exam was taken and the result.

Every student pursuing a PhD must pass a qualifying examination before becoming a candidate for the PhD. The qualifying examination consists of a six-hour written portion (generally given in two three-hour blocks on the same day), and an oral portion which may be given before or after the written portion. Both written and oral portions focus on fundamental and advanced civil engineering topics relevant to the student's specific program of study.

The oral portion may also explore specific skill areas required to conduct successful independent research. Students are deemed to have passed the examination based upon an overall evaluation of both the written and oral portions of the examination.

The qualifying examination is a pass/fail milestone in the PhD process. A letter indicating the result of each examination is placed in the student's graduate file. In rare cases, a student may be deemed to have conditionally passed the qualifying exam. This may occur when the student does extremely well in all but one area. Such a student must follow a prescribed plan to strengthen his or her knowledge and skills in the weak area and pass a special examination in the weak area within one calendar year. A student who conditionally passes the qualifying exam may register for dissertation credits and may form a Dissertation Committee.

While each student will take a different qualifying examination based upon an individual program of study, the exam is considered a departmental examination. All department faculty members in each civil engineering subdiscipline may participate in submitting written problems. Each student's academic advisory committee will review the entire exam before it is administered, and may suggest changes if it deems the examination, as presented, to be an inequitable test of the student's abilities. Recommendations on examination results are submitted by each student's Academic Advisory Committee. The departmental faculty, acting as a whole, votes to accept or reject such recommendations at a meeting scheduled for this purpose. Additionally:

1. 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.
2. A student may take the qualifying exam twice. A third attempt is permitted only with written permission from the Academic Advisory Committee and the approval of the department head. Under no circumstances may a student take the examination more than three times.
3. No student may register for CE 999X Dissertation credits until passing the qualifying exam.
4. A Dissertation Committee cannot be formed until the student passes the qualifying exam.
5. Any student who cannot pass the qualifying exam will be disqualified from the program.

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 his or her 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.

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.

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 semester of full-time study after passing the qualifying exam, or before 9 credits of dissertation credit are completed.

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 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 Committee. 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.

Construction Management

Program Directors:
Fletcher H. (Bud) Griffs and
Lawrence Chiarelli

Undergraduate Program

Beginning in fall 2018, admission to the Bachelor of Science in Construction Management will be suspended.

Students currently enrolled in the program will be able to complete their course of study.

Coursework in construction management and engineering, including the Construction Management Minor, will continue to be available for students in any major who are interested in construction. Students are encouraged to contact a Construction Management Program Advisor to plan a course of study.

The Construction Management, B.S. program is an interdisciplinary program in the Department of Civil and Urban Engineering. The program prepares students for a challenging career in the construction industry-as future leaders in a dynamic and ever-changing environment. It concentrates on the skills and understanding necessary to excel as a construction management professional and to compete in the marketplace. Graduates are engaged by owners, developers, construction managers, contractors, architects and engineers, lenders and other construction industry participants.

The Bachelor of Science in Construction Management program covers a broad range of subjects in engineering and construction management, such as planning, cost estimating, scheduling, project management and construction administration. The program also exposes students to the latest applications in construction research and technology. The program teaches students the fundamentals of engineering and construction science, as well as business aspects of construction and the application of traditional and emerging construction methods and technologies. Students also study basic economics, accounting and management principles.

Courses and projects in the program's junior and senior years illustrate current project management principles and methods by using materials from, and site visits to, construction projects led by experienced mentors.

Beyond the classroom, real-world work experience is available through internships and summer and part-time employment and through professional organizations and associated student chapters, including the Construction Management Association of America (CMAA), the Associated Schools of Construction (ASC), the American Society of Civil Engineers (ASCE), the Society of American Military Engineers (SAME) and the New York Building Congress (NYBC). NYU-Poly's Career Management Center also supports these efforts.

Goals and Objectives

The objective of the Bachelor of Science in Construction Management is to provide the following for its students:

- A solid foundation of knowledge in mathematics and the basic sciences as applied to construction management.
- The knowledge and skills to excel at an entry-level position as a construction professional and/or continue graduate study in construction management or a related field.
- The necessary written and oral communications skills to enable graduates to pursue leadership opportunities.
- A thorough understanding of state-of-the-art techniques and tools in construction management involving three-dimensional computer modeling, building information modeling (BIM), integration of information technology and the application of innovative planning, design and construction administration methodologies.
- A broad education in preparation for lifelong learning and individual growth. Students are required to take courses in writing and the humanities. Electives allow students to further customize their education to enhance individual interests.

Pedagogy

Construction management courses use a variety of pedagogical models, including theory-led teaching, case-method education and project-based and team-based teaching.

Teaching based on exposition of theory is applied to engineering and construction science. Fundamentals in mathematics, chemistry and physics, statics, mechanics of materials, modeling and construction methods and materials are necessary prerequisites to developing and applying construction management skills.

Case-method teaching uses real-world business experiences to demonstrate the application of general principles and to apply them to specific problems posed during instruction. This pedagogy is used to teach construction contracts and administration, estimating, scheduling, planning, safety and construction law.

Project-based and team-based education are experiential; students learn by doing, much as they would in a natural sciences laboratory class. Project-based education also provides students an opportunity to learn how to assemble and coordinate necessary information, assert authority and delegate responsibility. This skill is particularly important in construction management, in which the essential tasks are managing people and information.

It is common in construction management courses to employ all pedagogical approaches. The construction management faculty brings together theory-based instruction and an intimate understanding of state-of-the-art construction management practices.

The City of New York provides a universe of projects that are readily available to students to serve as a virtual laboratory. Construction documents and other resources are available to students for classroom study and visiting project sites. Faculty members who are actively involved in construction projects discuss the unique and special problems encountered on such projects, as well as potential solutions. Visits to professional offices and project sites are an essential part of an NYU Tandon construction management education.

Program Content

The construction management curriculum incorporates the following subject areas:

Area	Credits
General Education	24
Mathematics and the Sciences	22
Business and Management	19
Construction Science	24.5
Construction	26.5
Other	12
Total:	**128**

Part-Time Students

Students may register as part-time students (fewer than 12 credits a semester). Such students must be advised, however, that the department no longer offers many undergraduate courses in the evening, and part-time students are required to take most courses in the day. Part-time students should maintain close contact with their academic advisers to plan an appropriate course sequence.

Graduate Programs

NYU Tandon offers a Master of Science degree program in Construction Management and two graduate certificate programs: one in executive construction management (Exec 21) and the other in construction management.

The Exec 21 Program: Graduate Certificate Program in Executive Construction Management

The Exec 21 Certificate Program in Executive Construction Management (Exec 21) is offered by the Department of Civil and Urban Engineering. It is directed toward individuals with significant professional experience in the construction industry and it is focused primarily on the construction industry.

Exec 21 is a leadership program for construction professionals who may not wish to commit to the full Master of Science program, but seek formal certification in construction management. This group may include students who hold a bachelor's degree and who wish to specialize in construction management or those who may have previously completed an advanced degree and seek additional skills.

Recognized throughout the construction industry as a vital and innovative educational experience (recipient of the CMAA Academic Achievement Award), Exec 21 courses are taught by eminently qualified construction industry professionals and faculty.

Students without significant work experience who may not wish to commit to the full Master of Science program, but seek formal certification in construction management may enroll in the Certificate Program in Construction Management, jointly offered by the Department of Civil and UEngineering and the Department of Technology Management. That program includes general management courses in addition to construction management courses and does not require any work experience for full participation.

Admission
Students seeking admission to the Exec 21 Certificate Program should have earned a bachelor's degree in a related discipline and should have a minimum of three to five years of related professional experience. Undergraduate backgrounds in engineering, mathematics, science, management and/or the liberal arts are appropriate with the requisite work experience for admission.

Graduate Certificate in Construction Management

The Department of Civil Engineering, in conjunction with the Department of Technology Management, offers a graduate certificate to students completing 15 credits of course work in construction management. The certificate program provides engineers and other professionals in the construction industry with the knowledge to understand relevant managerial and physical technological developments and to apply such knowledge effectively in their professions.

Admission
Applicants for the Certificate in Construction Management must hold relevant bachelor's degrees. Compatible backgrounds include engineering, math, science, management, architecture, economics, law and the liberal arts. The undergraduate degree must be from an acceptable institution.

Master of Science in Construction Management

The Master of Science in Construction Management program requires 30 credits of course work. Courses include those in the Exec 21 and Construction Management certificate programs, Master of Science in Civil Engineering program courses in construction management and elective courses from other NYU Tandon graduate programs.

Courses taken as part of the Exec 21 Certificate Program in Executive Construction Management and the Graduate Certificate Program in Construction Management may be applied toward the Master of Science in Construction Management and the Master of Science in Civil Engineering.

Objectives
The Master of Science in Construction Management program is intended to prepare students for leadership positions in the construction industry. Specifically, the program seeks to provide a thorough understanding of:

- Basic management principles as applied to the construction industry;
- Principles of leadership in the construction industry;
- Integration of modern technology in construction;
- Innovative management tools for the analysis and control of construction projects;
- Principles and methods of planning and financing construction projects; and
- Fundamental tools for communication with diverse employee, client-and public groups.

Admission
Students seeking admission to the Master of Science in Construction Management program must hold a bachelor's degree from an accredited undergraduate institution. Students should have a minimum undergraduate grade-point average of 3.0, although this requirement can be waived for candidates with sufficient professional experience in construction management. All candidates are expected to have sufficient background in college-level mathematics; this requirement will be evaluated by a Construction Management Program Director. Students whose academic and

professional backgrounds are deemed to be deficient may be required to complete additional undergraduate courses as a pre- or co-requisite to admission to any Construction Management program.

Transfer Credits
The residency requirement for the Master of Science degree is 21 credits. This is the minimum number of graduate credits that students must take at NYU Tandon to be awarded a Master of Science degree.

Students may request the transfer of up to 9 credits of acceptable course work, as determined by a Construction Management Program Director, toward the Master of Science in Construction Management. Such course(s) must be relevant to the student's degree program and be taken at an accredited institution, and the student must have earned a grade of B or better. No transfer credit is awarded for courses in which a grade less than B was earned. Pass/fail courses will not be considered for transfer unless accompanied by a detailed written evaluation by the course instructor.

All transfer credit requests must be accompanied by an official transcript from the transferring institution. Applications for transfer credits are not considered until the candidate has earned a minimum of 12 graduate credits at NYU Tandon.

Validation credits by examination cannot be used toward fulfillment of the requirements of any graduate program.

Registration for Exec 21 Core Courses
Students not enrolled in the Exec 21 Program must obtain the prior approval of a Construction Management Program Director to register for Exec 21 Core Courses.

Campus

Graduate courses may be offered at NYU Tandon's campus in Brooklyn and at 2 Broadway in downtown Manhattan.

Applications from Foreign Institutions

Applicants to any graduate program in Construction Management from universities outside the United States must achieve a minimum score of 700 on the quantitative section of the Graduate Record Examination (GRE) and a minimum score of 550 (PBT), 213 (CBT), or 80 (IBT) on the Test of English as a Foreign Language (TOEFL). A Construction Management Program Director may waive the GRE and/or TOEFL requirement in exceptional circumstances after examining an applicant's transcripts or an interview with the applicant.

Foreign applicants who meet all admission requirements, but who fail to satisfy the TOEFL requirement, may be required to take one or more remedial courses in English before or as a condition to admission.

Non-Degree

Construction Management Minor

Much of what is designed by civil engineers is intended to be built or constructed in some manner. The goals of the minor are to teach fundamental technical and leadership skills and promote a greater understanding of relationships among construction and the other professions to students from the various engineering disciplines and other majors who may in some way become involved in the planning, construction, maintenance or operation of built systems. For this reason, the minor is open to any courses within the undergraduate Construction Management program (subject to the within described credit and course prerequisites), and it will allow students to select courses that best fit their interests and complement their curricula.

A basic understanding of construction is necessary to take full advantage of the courses in the Construction Management curriculum. CE-UY 1502 Leadership and Foundations of Construction Management (formerly CE 1504) is the first major course in the Construction Management curriculum and serves as the introduction to major course for the program. CE-UY 1502 is a prerequisite to all other undergraduate Construction Management courses, except CE-UY 4533 Construction Law. This prerequisite can also be satisfied by an appropriate introduction to major course in another curriculum, such as CE-UY 1002 Introduction to Civil Engineering. The determination as to whether any other course may satisfy this prerequisite is subject to the evaluation and approval of the Construction Management Program Director. In addition, students who have taken CE-UY 1002 (or its predecessor course) or another acceptable prerequisite may take CE-UY 1502 (or have taken its predecessor course) with the approval of the Construction Management Program Director in satisfaction of the minor requirement. All other prerequisites shall be as stated in the Bulletin. CE-UY 2533 Construction Project Management and one additional CE-UY 25xx course are also required for the minor.

The individual courses taken to fulfill the requirements of the minor each may be 1, 2, 3 or 4 credits. Students must earn a passing grade in not less than five courses and not less than 14 credits.

Note: The above prerequisites are effective for students first enrolled in or after Fall 2018. See prior editions of the Bulletin for prerequisites applicable to students first enrolled prior to Fall 2018.

Contact Information:

Departmental Adviser: Lawrence Chiarelli

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Bachelor of Science

Construction Management, B.S.

Undergraduate Program

The Bachelor of Science in Construction Management is an interdisciplinary program in the Department of Civil and Urban Engineering. The program prepares students for a challenging career in the construction industry-as future leaders in a dynamic and ever-changing environment. It concentrates on the skills and understanding necessary to excel as a construction management professional and to compete in the marketplace. Graduates are engaged by owners, developers, construction managers, contractors, architects and engineers, lenders and other construction industry participants.

The Bachelor of Science in Construction Management program covers a broad range of subjects in engineering and construction management, such as planning, cost estimating, scheduling, project management and construction administration. The program also exposes students to the latest applications in construction research and technology. The program teaches students the fundamentals of engineering and construction science, as well as business aspects of construction and the application of traditional and emerging construction methods and technologies. Students also study basic economics, accounting and management principles.

Courses and projects in the program's junior and senior years illustrate current project management principles and methods by using materials from, and site visits to, construction projects led by experienced mentors.

Beyond the classroom, real-world work experience is available through internships and summer and part-time employment and through professional organizations and associated student chapters, including the Construction Management Association of America (CMAA), the Associated Schools of Construction (ASC), the American Society of Civil Engineers (ASCE), the Society of American Military Engineers (SAME) and the New York Building Congress (NYBC). NYU's Career Management Center also supports these efforts.

Goals and Objectives

The objective of the Bachelor of Science in Construction Management is to provide the following for its students:
• A solid foundation of knowledge in mathematics and the basic sciences as applied to construction management.
• The knowledge and skills to excel at an entry-level position as a construction professional and/or continue graduate study in construction management or a related field.
• The necessary written and oral communications skills to enable graduates to pursue leadership opportunities.
• A thorough understanding of state-of-the-art techniques and tools in construction management involving three-dimensional computer modeling, building information modeling (BIM), integration of information technology and the application of innovative planning, design and construction administration methodologies.
• A broad education in preparation for lifelong learning and individual growth. Students are required to take courses in writing and the humanities. Electives allow students to further customize their education to enhance individual interests.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviors that students acquire as they progress through the program. The Department has adopted the seven (7) fundamental outcomes specified by ABET, as they cover the full breadth and depth of the abilities and skills needed:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Curriculum

The Bachelor of Science in Construction Management program is advised by a Department Industry Advisory Board, comprising leaders from the engineering and construction professions to help assess and update the program curriculum. The general requirements of the curriculum accommodate the continually expanding requirements of the profession, advancements in knowledge and the contributions of related disciplines.

Table 1 summarizes the Construction Management curriculum by subject category. A typical four-year schedule for the program is included at the end of this section of the bulletin.

Table 1: Curriculum for the BS in Construction Management

Required Courses in Mathematics & Science: 22 Credits

- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- CS-UY 1133 Engineering Problem Solving and Programming *3 Credits*
- MA-UY 1024 Calculus I for Engineers *4 Credits* [1]
- MA-UY 1124 Calculus II for Engineers *4 Credits*
- MA-UY 2054 Applied Business Data Analysis I *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*

Required Courses in Humanities and Social Sciences: 24 Credits

- EXPOS-UA 1 Writing the Essay *4 Credits* [2]
- EXPOS-UA 2 The Advanced College Essay *4 Credits* [2]
- Humanities/Social Sciences Electives *16 Credits* [3]

Required Courses in Management, Economics, Finance or related coursework: 14 Credits

See Footnote [4]

- MG-UY 2204 Financial Accounting *4 Credits*
  or
  FIN-UY 2103 Creating and Understanding Financial Statements *3 Credits*
- FIN-UY 2003 Economic Foundations of Finance *3 Credits*
  or
  any Economics elective
- MG/EC/FIN Level 3xxx or 4xxx Elective *Various Credits*
- MG/EC/FIN Level 3xxx or 4xxx Elective *Various Credits*

Required Courses in Engineering and Construction Management: 52 Credits

- EG-UY 1003 Introduction to Engineering and Design *3 Credits*
- CE-UY 2133 Engineering Mechanics *3 Credits*
- CE-UY 2123 Mechanics of Materials *3 Credits*
- CE-UY 2513 Construction Materials and Methods *3 Credits*
- CE-UY 2523 Contracts and Construction Documents *3 Credits*
- CE-UY 3161 Materials Engineering Laboratory *1 Credits*
- CE-UY 3503 Cost Estimating *3 Credits*
- CE-UY 3513 Construction Scheduling *3 Credits*
- CE-UY 3533 Construction Site Layout and Surveying *3 Credits*
- CE-UY 3553 Non-Structural Building Systems *3 Credits*
- CE-UY 3563 Construction Modeling and Data Structures II *3 Credits*
- CE-UY 4503 Construction Engineering *3 Credits*
- CE-UY 4513 Construction Project Administration *3 Credits*
- CE-UY 4523 Structural Building Systems *3 Credits*

- CE-UY 4533 Construction Law *3 Credits*
- CE-UY 4853 Construction Management Capstone *3 Credits*

Total Credits for Degree: 128 Credits

Footnotes for Table 1

[1] Students may substitute MA-UY 1324, which includes two additional contact hours, for MA-UY 1024.

[2] All students take a writing placement examination. Students for whom English is a second language may be placed in an ESL section, which includes additional hours of language education. Students also may be placed in a remedial section, based upon the exam results, which may or may not carry degree credit.

[3] Student must complete 16 additional credits in Humanities and Social Sciences. At least one elective shall contain at least one credit of ethics. At least one elective must be a 3xxx/4xxx level course. At least one elective must be a writing-intensive course, labeled by "W."

[4] As courses in this category vary among two, three and four credits, the remaining credits can be satisfied by any electives in this category.

Typical Course of Study for the Bachelor of Science in Construction Management

Freshman Year

Fall Semester: 15 Credits

- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- MA-UY 1024 Calculus I for Engineers *4 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*

Spring Semester: 16 Credits

- PH-UY 1013 Mechanics *3 Credits*
- CS-UY 1133 Engineering Problem Solving and Programming *3 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*

Sophomore Year

Fall Semester: 17/18 Credits

- CE-UY 2133 Engineering Mechanics *3 Credits*
- CE-UY 2513 Construction Materials and Methods *3 Credits*
- MG-UY 2204 Financial Accounting *4 Credits*
  or

FIN-UY 2103 Creating and Understanding Financial Statements *3 Credits*

- Humanities and Social Science Elective *4 Credits*

Spring Semester: 17/18 Credits

- CE-UY 2123 Mechanics of Materials *3 Credits*
- CE-UY 2523 Contracts and Construction Documents *3 Credits*
- FIN-UY 2003 Economic Foundations of Finance *3 Credits*
  or
  Any Economics Elective (ECON xxxx) *4 Credits*
- MA-UY 2054 Applied Business Data Analysis I *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Junior Year

Fall Semester: 17 Credits

- CE-UY 3503 Cost Estimating *3 Credits*
- CE-UY 3513 Construction Scheduling *3 Credits*
- CE-UY 3533 Construction Site Layout and Surveying *3 Credits*
- Liberal Arts & Sciences Elective *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Spring Semester: 14/15 Credits

- CE-UY 3553 Non-Structural Building Systems *3 Credits*
- CE-UY 3563 Construction Modeling and Data Structures II *3 Credits*
- CE-UY 3161 Materials Engineering Laboratory *1 Credits*
- Liberal Arts and Sciences Elective *4 Credits*
- MG/EC/FIN Elective *3 or 4 Credits*

Senior Year

Fall Semester: 16 Credits

- CE-UY 4513 Construction Project Administration *3 Credits*
- CE-UY 4523 Structural Building Systems *3 Credits*
- MG/EC/FIN Elective (3xxx or 4xxx) *2,3, or 4 Credits*
- Liberal Arts & Sciences Elective *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Spring Semester: 16/17 Credits

- CE-UY 4503 Construction Engineering *3 Credits*
- CE-UY 4533 Construction Law *3 Credits*
- CE-UY 4853 Construction Management Capstone *3 Credits*

- MG/EC/FIN Elective (3xxx/4xxx) *3 or 4 Credits*
- Liberal Arts and Sciences Elective *4 Credits*

Total credits required for the degree: 128

Graduate Certificate

Construction Management Advanced Certificate

Curriculum

Students must complete at least five courses (15 credits) in accordance with the following requirements:

i. Select at least three courses (9 credits) from those courses that satisfy the Major Requirement for the Master of Science in Construction Management Program and are approved by a Construction Management Program Director; and
ii. Select at least one (3 credits) graduate-level Management (MG) course approved by a Construction Management Program Director.

Grade Requirements

Students must achieve a B (3.0) cumulative average in all graduate courses taken at NYU Tandon School of Engineering.

Executive Construction Management (Exec 21) Advanced Certificate

Curriculum

Students must complete 15 credits of course work to earn a certificate. A minimum of 9 credits must be selected from the Exec 21 Core Courses, and up to 6 credits may be selected from those courses that satisfy the Major Requirement for the Master of Science in Construction Management Program and are approved by a Construction Management Program Director.

Exec 21 Core Courses:

- CE-GY 8703 Managing and Leading in the 21st Century *3 Credits*
- CE-GY 8713 Construction and the Law *3 Credits*
- CE-GY 8723 How to Succeed in Construction *3 Credits*
- CE-GY 8733 Infrastructure Financing: Structuring of a Deal *3 Credits*
- CE-GY 875X Employer Focused Residency *Up to 3 credits Credits*
- CE-GY 8763 Capital Program Management/Program Development *3 Credits*
- CE-GY 8773 Dispute Avoidance and Resolution *3 Credits*

- CE-GY 8783 Construction Management and Planning *3 Credits*
- CE-GY 8803 Infrastructure Planning for Public Works *3 Credits*

Grade Requirements

Students must maintain a B (3.0) cumulative average in all graduate courses taken at NYU Tandon School of Engineering.

Master of Science

Construction Management, M.S.

Curriculum

A minimum of 15 credits (5 courses) must be selected from the following courses:

- CE-GY 7963 Selected Topics in Construction I *3 Credits*
- CE-GY 7973 Selected Topics in Construction II *3 Credits*
- CE-GY 8243 Construction Modeling Techniques *3 Credits*
- CE-GY 8253 Project Management for Construction *3 Credits*
- CE-GY 8263 Construction Cost Estimating *3 Credits*
- CE-GY 8273 Contracts and Specifications *3 Credits*
- CE-GY 8283 Risk Analysis *3 Credits*
- CE-GY 8293 Construction Operations Analysis *3 Credits*
- CE-GY 8303 Information Systems in Project Management *3 Credits*
- CE-GY 8313 Engineering for Construction I: Methods and Technologies *3 Credits*
- CE-GY 8323 Engineering for Construction II: Design *3 Credits*
- CE-GY 8333 Marketing for Construction Management and Engineering Services *3 Credits*
- CE-GY 8343 Construction Site Safety *3 Credits*
- CE-GY 8353 Construction Scheduling *3 Credits*
- CE-GY 8363 Building Information Modeling Project Controls *3 Credits*
- CE-GY 8373 Construction Accounting and Finance *3 Credits*
- CE-GY 8383 Building Information Modeling (BIM) and Its Applications in AEC/FM *3 Credits*
- MG-GY 8203 Project Management *3 Credits*
- MG-GY 6013 Organizational Behavior *3 Credits*
  The following Exec21 Core Courses may be applied to the above Major Requirement by a student who is enrolled in or has completed the Exec21 Program, or by any other student with consent of a Construction Management Program Director.
- CE 8703 Managing and Leading in the 21st Century *3 Credits*
- CE 8713 Construction and the Law *3 Credits*
- CE 8723 How to Succeed in Construction *3 Credits*
- CE 8733 Infrastructure Financing: Structuring of a Deal *3 Credits*
- CE 875X Employer Focused Residency *Up to 3 credits Credits*
- CE 8763 Capital Program Management/Program Development *3 Credits*
- CE 8773 Dispute Avoidance and Resolution *3 Credits*

- CE 8783 Construction Management and Planning *3 Credits*
- CE 8803 Infrastructure Planning for Public Works *3 Credits*

Note:

The above list is subject to change as courses are added to, or deleted from the Program.

All students must complete a minor concentration of study, which shall consist of a minimum of 6 credits (two courses), and not more than 9 credits (three courses), selected from courses in any single graduate academic program at NYU Tandon School of Engineering, or any other concentrated area of study approved by a Construction Management Program Director. The selection of the minor concentration of study shall be made with the advisement and consent of a Construction Management Program Director.

Students entering the program **prior to Spring 2019** may complete an up to three (3)-credit independent project to satisfy the Major Requirement: CE-GY 9963 MS Project in Civil & Urban Engineering. Each student entering the program in **Spring 2019 onward** MUST complete either: (a) CE-GY 8393 Leadership, Ethics, and Project Execution; (b) CE-GY 9963 MS Project in Civil & Urban Engineering; or (c) another approved capstone course. A student shall not enroll in such course until after such student has completed eighteen (18) credits, or such student is in the final semester of enrollment in the program, whichever is sooner.

The remaining courses needed to fulfill the 30-credit requirement shall be selected from the Civil Engineering, Transportation or Construction Management Programs (bearing a CE-GY xxxx or TR-GY xxxx designation), unless otherwise authorized by a Construction Management Program Director. However, if the minor area of study is from the Civil and Urban Engineering Department, up to two of the remaining courses may be selected from any other electives at NYU Tandon School of Engineering.

Note that some electives include prerequisites that not all program enrollees may have completed. Students cannot register for a course for which they have not satisfied the stated prerequisites unless they have the written permission of both the course instructor and a Construction Management Program Director.

Grade Requirements

To earn a Master of Science in Construction Management, students must maintain a B (3.0) cumulative average in all graduate courses taken at NYU Tandon School of Engineering.

Environmental Engineering and Science

Academic Adviser: Mohsen Hossein

The Department of Civil and Urban Engineering offers graduate programs in environmental engineering and environmental science leading to the following degrees:

- Environmental Engineering, M.S.
- Environmental Science, M.S.

The department also offers the following graduate programs with a concentration in environmental and water resource engineering:

- Civil Engineering, M.S.
- Civil Engineering, Ph.D.

Programs in environmental engineering and environmental science are described below. Programs in civil engineering with a concentration in environmental and water resource engineering are described in the Civil Engineering Program section of this catalog.

Master of Science programs are practice oriented with a strong foundation in underlying principles and methods. The PhD is intended for students with a strong research interest and a desire to advance the state of the art with their research.

Environmental science and environmental engineering are multidimensional professions dealing with preserving, protecting and remedying air, water and soil environments. The program prepares graduates to be employed immediately to meet the challenges of this century or to proceed directly to advanced graduate studies.

General Requirements for Environmental Programs

Admission Requirements

Applicants for the Master of Science in Environmental Engineering should hold an undergraduate or graduate degree in environmental or civil engineering or equivalent from an accredited institution. Students may be accepted with other related backgrounds, but should, as a minimum, have one year of chemistry and physics and basic courses in calculus and differential equations. Such students may be asked to take up to 15 credits of undergraduate courses to complete their preparation. Applicants for the Master of Science in Environmental Science typically have undergraduate or graduate degrees in the physical, chemical or biological sciences. The adviser may require or recommend undergraduate courses to make up for academic preparation deficiencies.

Admission to the PhD program requires a suitable MS degree from an acceptable institution. A minimum GPA of 3.5 in master's level work is generally required for admission. For more information about the PhD in Civil Engineering, consult the Civil Engineering Program section of this catalog.

Grade Requirements

To earn graduate degrees, NYU Tandon requires that students have a 3.0 GPA or better in all graduate courses and in all guided studies (readings, projects, theses, dissertations). Averages are computed separately for courses and guided studies. Transfer credits from other institutions are not included in this average.

Analytic Background

All applicants for MS in environmental programs must show evidence of quantitative analytic ability, generally including a minimum of two years of college mathematics and a college-level course in statistics.

PhD applicants are expected to have a superior quantitative analytic background. In addition, they are advised to take at least one course in graduate level statistics, regression analysis or design of experiments as part of their studies.

Advising

Each graduate student is assigned a faculty academic adviser. Students must maintain frequent contact with their advisers throughout their studies. Students must meet with their academic advisers before each registration and at any other time they need advice or consultation.

Students must have a detailed program of study formally approved by their advisers before registration. Advisers also handle requests for waiver of certain degree requirements. Such waivers must be approved in writing and placed in the student's departmental file.

Where specific courses are waived, instructor permission is also required. When waivers are granted, students may be required to take other specific courses in their place or to select additional electives.

Students who register for any guided studies (readings, projects, theses, dissertation) are supervised by a project adviser for each activity. A project adviser may or may not be the same as a student's academic adviser, depending upon the selected subject matter. To register for any guided study activity, students must submit written proposals to a project adviser before registration. To register, students must obtain written approval from their project and academic advisers. Doctoral students may not register for dissertation credits until they have passed the PhD qualifying examination.

In addition to academic and project advisers, students studying under research or teaching fellowships are assigned fellowship advisers. Normally, these would be either the principal investigator of the research effort funding the fellowship or the director of the academic area in which the teaching fellowship is awarded.

While academic advisers consult and advise students, the student is responsible for ensuring that all degree requirements are fulfilled and all necessary forms and applications are submitted.

Transfer Credits

Students must take a minimum of 24 credits at NYU Tandon in order to be awarded an MS degree. Students may transfer up to 6 credits of acceptable courses toward a MS degree, subject to the academic adviser's approval. To be transferred, the course(s) must be relevant to the program and from an acceptable institution. A grade of B or better is required for any transfer credit.

Courses graded on a pass/fail basis are not considered for transfer unless accompanied by a detailed written evaluation by the course instructor. All transfer requests must be accompanied by an official transcript from the transferring institution. Application for transfer credits is accepted only after the student has earned 12 credits at NYU Tandon.

Doctor of Philosophy in Civil Engineering

Students wishing to pursue a doctoral degree in environmental engineering and environmental science may do so under the PhD in civil engineering and environmental science. For detailed information, please consult the Civil Engineering Program section of this catalog.

Graduate Courses

For the list of graduate courses, please consult the Environmental and Water Resources Engineering section of the Civil Engineering Program in this catalog.

Master of Science

Environmental Engineering, M.S.

Goals and Objectives

The MS in Environmental Engineering prepares graduates to plan, functionally design, control, operate and manage municipal and industrial pollution-prevention systems. Students are exposed to a learning atmosphere that provides a mix of theoretical and practical approaches. Courses include a mix of presentations, project exercises and practical problem solutions.

Specific program objectives are to provide the skills necessary to:

- fundamentally understand the science and engineering of natural and man-made environmental systems;
- functionally design air, water and waste treatment systems and components;
- control and operate environmental facilities;
- understand the modeling and simulation of environmental systems; and
- participate actively in multidisciplinary teams to solve environmental problems.

Program Requirements

Core Courses: 12 Credits

- CE-GY 7373 Environmental Chemistry and Microbiology *3 Credits*
- CE-GY 7423 Water and Wastewater Treatment *3 Credits*

and select 2 of the following 4 courses:

- CE-GY 7223 Hydrology *3 Credits*
- CE-GY 7233 Groundwater Hydrology and Pollution *3 Credits*
- CE-GY 7753 Environmental Systems Management *3 Credits*
- CE-GY 7673 Environmental Impact Assessment *3 Credits*

Major Courses: Minimum of 9 Credits

Select 3 of the following (minimum):

- CE-GY 7393 Advanced Environmental Chemistry and Microbiology *3 Credits*
- CE-GY 7433 Advanced Water and Wastewater Treatment *3 Credits*
- CE-GY 7473 Modeling Fate and Transport of Surface Water Pollution *3 Credits*
- CE-GY 8493 Environmental Geotechnology *3 Credits*
- CE-GY 7703 Solid Waste Management *3 Credits*
- CE-GY 7523 Air Pollution *3 Credits*
- CE-GY 7573 Detection and Control of Waterborne Pathogens *3 Credits*
- CE-GY 8283 Risk Analysis *3 Credits*
- CE-GY 7723 Selected Topics in Environmental and Water Resources Eng I *3 Credits* - Geomatics & GIS In Civil and Env Eng.
- CE-GY 7353 Selected Topics in Water Resources and Hydraulic Engineering I *3 Credits* - Design of Wetlands
- CE-GY 7363 Selected Topics in Water Resources and Hydraulic Engineering II *3 Credits*
- CE-GY 7653 Wetland Design for Water Quality Improvement *3 Credits*

- CE-GY 7713 Selected Topics in Environmental and Water Resources Eng *3 Credits*
- CE-GY 7733 Geomatics and GIS Application in Civil and Environmental Engineering *3 Credits*

Optional Master Project or Thesis: 3-6 Credits

Students may opt to take additional approved engineering and science electives rather than complete a MS project or thesis for their degree.

- CE-GY 9963 MS Project in Civil & Urban Engineering *3 Credits*
- CE-GY 997X Thesis for MS in Civil Engineering *3-6 Credits*

Electives: 3-6 Credits

3-6 credits of approved engineering and science electives

Total: 30 Credits

Environmental Science, M.S.

Goals and Objectives

The primary goal of the MS in Environmental Science is to prepare professionals to:

- fundamentally understand the science and applied engineering of natural and manmade environmental systems;
- evaluate the interactions between man and the environment and control adverse impacts of pollution on ecological systems;
- understand the monitoring and laboratory analysis of environmental systems; and
- participate actively in a multidisciplinary team of professionals to solve environmental problems.

Program Requirements

1. Core Courses: 9 Credits

- CE-GY 7373 Environmental Chemistry and Microbiology *3 Credits*
- CE-GY 7423 Water and Wastewater Treatment *3 Credits*
- CE-GY 7223 Hydrology *3 Credits*

2. Twelve credits of approved courses

Courses may be taken in Environmental Engineering, Chemical and Biological Engineering at NYU Tandon, and NYU Environmental Health Science, including up to 6 approved transfer credits.

Suggested Approved Courses:

- CE-GY 7233 Groundwater Hydrology and Pollution *3 Credits*
- CE-GY 7393 Advanced Environmental Chemistry and Microbiology *3 Credits*
- CE-GY 7433 Advanced Water and Wastewater Treatment *3 Credits*
- CE-GY 7473 Modeling Fate and Transport of Surface Water Pollution *3 Credits*
- CE-GY 7523 Air Pollution *3 Credits*
- CE-GY 7553 Environmental Toxicology *3 Credits*
- CE-GY 7573 Detection and Control of Waterborne Pathogens *3 Credits*
- CE-GY 7673 Environmental Impact Assessment *3 Credits*
- CE-GY 7703 Solid Waste Management *3 Credits*
- CE-GY 7753 Environmental Systems Management *3 Credits*
- CE-GY 9963 MS Project in Civil & Urban Engineering *3 Credits*
- CE-GY 997X MS Thesis in Civil & Urban Engineering Department *6 Credits*
- CE-GY 7353 Selected Topics in Water Resources and Hydraulic Engineering I *3 Credits* - Design of Wetlands
- CE-GY 7723 Selected Topics in Environmental and Water Resources Eng I *3 Credits* - Geomatics & GIS In Civil and Env Eng.
- BIOL-GA 1004 Environmental Health (NYU CAS) *3 Credit*s
- EHSC-GA 1010 Weather, Air pollution and Health (NYU CAS) *3 Credits*
- EHSC-GA.1006 Toxicology (NYU CAS) *3 Credits*
- CE-GY 6053 Monitoring Cities *3 Credits*
- CE-GY 7363 Selected Topics in Water Resources and Hydraulic Engineering II *3 Credits*
- CE-GY 7653 Wetland Design for Water Quality Improvement *3 Credits*
- CE-GY 7713 Selected Topics in Environmental and Water Resources Eng *3 Credits*
- CE-GY 7733 Geomatics and GIS Application in Civil and Environmental Engineering *3 Credits*

3. Nine credits of approved elective courses

Total: 30 Credits

Transportation

Program Adviser: Elena S. Prassas

The Department of Civil and Urban Engineering offers graduate degree programs in transportation leading to the following degrees:

- Transportation Planning and Engineering, M.S.
- Transportation Management, M.S.
- Transportation Planning and Engineering, Ph.D.

Master of Science programs are practice-oriented with a strong foundation in underlying principles and methods. The PhD is intended for students with a strong research interest and a desire to advance the state-of-the-art as a result of that research.

A number of graduate certificate programs are also available in:

- Traffic Engineering
- Transportation Planning
- Transportation Management

Graduate certificates, which entail completion of 12 focused credits of study, offer the opportunity for students to specialize in one of the areas of transportation planning and engineering. It also allows students not ready to embark on a full Master of Science degree program to receive formal recognition for more focused study.

Requirements for Master of Science Programs

Admission Requirements

To be eligible for admission as an MS candidate, applicants must hold at least a baccalaureate degree from an acceptable institution. Students pursuing degrees in transportation planning and engineering must also have a firm background in quantitative analytic skills. If admitted, students lacking such skills must take remedial courses in addition to degree requirements to strengthen their analytic competency.

All foreign students admitted to transportation programs must take an examination in English before registration. Based upon an evaluation of the examination, they may be required to take up to two additional courses in English as a Second Language (ESL) for which no graduate credit is given.

Grade Requirements

To earn Master of Science degrees or graduate certificates, students must have a 3.0 GPA or better in all graduate courses and in all guided studies (readings, projects, theses). Averages are separately computed for courses and guided studies. Transfer credits from other institutions are omitted from this average.

In addition, transportation program students are required to have an overall 3.0 GPA in all courses required for their degree or certificate program. Students may not repeat a course toward any of the transportation-degree programs more than once.

Analytic Background

All applicants for MS or graduate certificate programs in transportation must show evidence of quantitative analytic ability, generally including a minimum of two years of college mathematics. A college-level course in statistics is desirable.

Advising

Each student in the Master of Science program is assigned a faculty adviser. It is important that students frequently contact their adviser during their studies.

Students must meet with their academic adviser before each registration and at any other time they need advice or consultation. Students must have a detailed program of study formally approved by the adviser before registration. Advisers also handle requests for waiver of certain degree requirements. Such waivers must be approved in writing and must be entered into the student's departmental file. Where specific courses are waived, the permission of the course instructor is also required. When waivers are granted, students may be required to take other specific courses in their place; otherwise additional electives will be selected.

Students registering for any guided studies (readings, projects, theses) are assigned project advisers for each such activity. The project adviser may or may not be the same as the student's academic adviser, depending upon the subject matter. To register for any guided study activity, students must submit written proposals for the topic(s) to be covered to a project adviser before registration. To register, students must obtain the written approval of the project adviser and the academic adviser.

In addition to academic and project advisers, students studying under research or teaching fellowships are assigned fellowship advisers. Normally, these would be either the principal investigator of the research effort funding the fellowship or the director of the academic area in which the teaching fellowship is awarded.

While academic advisers consult and advise students, it is the student's responsibility to fulfill all degree requirements and to submit all proper forms and applications.

Transfer Credits

The minimum number of credits students must take at NYU Tandon for an MS degree is 21 credits. All credits for a graduate certificate must be taken at NYU Tandon.

Students may transfer up to 9 credits of acceptable courses toward a MS degree, subject to the approval of the academic adviser. To be transferred, the courses must relate to the transportation program and be from an acceptable institution. A grade of B or better is required to receive transfer credit. Courses graded on a pass/fail basis are not considered for transfer unless accompanied by a detailed written evaluation by the instructor of the course. All transfer requests must be accompanied by an official transcript from the transferring institution. Applications for transfer credits are accepted only after students have earned 12 credits at NYU Tandon. Validation credits by examination may not be used toward any transportation degree program.

Graduate Certificate Programs

The Transportation Program offers graduate certificates to students completing 12 credits of study in specified areas of concentration. This program is for students who do not wish to commit to a full advanced degree. Applicants may be students with bachelor's degrees seeking to specialize in an aspect of transportation or those with advanced degrees wishing additional course work in a highly focused area of the profession.

Students in certificate programs may apply for transfer to degree programs without any loss of credits, assuming they are admitted to the degree program and that the courses are related to the degree.

Admission to a certificate program does not guarantee admission to a full degree program.

Graduate Certificate

Traffic Engineering Advanced Certificate

Advanced Certificate in Traffic Engineering

Curriculum

Students must complete 12 credits of course work to earn an advanced certificate. Seven and a half credits are required courses, One 1.5-credit course plus one three-credit course are chosen from the lists below.

Required Courses

- TR-GY 6053 Transportation Economics and Finance Fundamentals *3 Credits* [1]
- TR-GY 6333 Transportation & Traffic Concepts *3 Credits*
- TR-GY 6343 Traffic Operations & Control *3 Credits*

Select One of the Following:

- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*
- TR-GY 7033 Multimodal Transportation Safety *3 Credits*
- TR-GY 7323 Design of Parking and Terminal Facilities *3 Credits*

Grade Requirements

Students must maintain a B (3.0) cumulative average in all graduate courses taken at NYU Tandon School of Engineering.

Note:

[1] Effective Spring 2019. Students entering the Advanced Certificate program prior to Spring 2019 may take TR-GY 6011 Fundamental Concepts in Transportation *1.5 Credits* and TR-GY 6211 Economic Analysis of Transportation Alternatives *1.5 Credits* in place of TR-GY 6053.

Transportation Management Advanced Certificate

Advanced Certificate in Transportation Management

Curriculum

Students must complete 12 credits of course work to earn an advanced certificate. Nine credits are required courses, plus three credits are chosen from the list of elective courses.

Required Courses

- TR-GY 6053 Transportation Economics and Finance Fundamentals *3 Credits* [1]
- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*
- TR-GY 7223 Management of Transit Maintenance and Operations *3 Credits*
  and select either
- TR-GY 7213 Transportation Management *3 Credits*
  or
- TR-GY 7133 Urban Public Transportation Systems *3 Credits*

Grade Requirements

Students must maintain a B (3.0) cumulative average in all graduate courses taken at NYU Tandon School of Engineering.

Note:

[1] Effective Spring 2019. Students entering the Advanced Certificate program prior to Spring 2019 may take TR-GY 6011 Fundamental Concepts in Transportation *1.5 Credits* and TR-GY 6211 Economic Analysis of Transportation Alternatives *1.5 Credits* in place of TR-GY 6053.

Transportation Planning Advanced Certificate

Advanced Certificate in Transportation Planning

Curriculum

Students must complete 12 credits of course work to earn an advanced certificate. Nine credits are required courses, plus three credits are chosen from the list of elective courses.

Required Courses

- TR-GY 6013 Fundamental Concepts in Transportation *3 Credits*
- TR-GY 6113 Forecasting Urban Travel Demand *3 Credits*
- TR-GY 6333 Transportation & Traffic Concepts *3 Credits*

Select Three Credits from the Following:

- TR-GY 7133 Urban Public Transportation Systems *3 Credits*
- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*
- TR-GY 7033 Multimodal Transportation Safety *3 Credits*

Grade Requirements

Students must maintain a B (3.0) cumulative average in all graduate courses taken at NYU Tandon School of Engineering.

Master of Science

Transportation Management, M.S.

Master of Science in Transportation Management

The program is for practicing professionals who deal with a public transit system, and agency and/or facility management. It combines basic management skills with a working knowledge of techniques and approaches to optimize transportation system results.

Goals and Objectives

The primary goal of the MS in Transportation Management is to prepare professionals to effectively and efficiently manage various transportation enterprises. The emphasis is on agencies, facilities and services in the public sector. Specific objectives of the program are to provide:

- a basic background in management skills and techniques, specifically as applied to public and private transportation organizations;
- basic understanding of the economic aspects of the transportation sector;
- an understanding of the importance of national, state and local transportation policy on public and private sector organizations;
- fundamental knowledge on some specific issues and problems in managing and operating public transportation facilities.

Program Requirements

Required Courses: 15 Credits

The following courses are required of all students:

- TR-GY 6053 Transportation Economics and Finance Fundamentals *3 Credits* [1]
- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*
- TR-GY 7223 Management of Transit Maintenance and Operations *3 Credits*
- TR-GY 7213 Transportation Management *3 Credits* OR CE-GY 8203 Project Management *3 Credits* OR CE-GY 8253 Project Management for Construction *3 Credits*
- TR-GY 7133 Urban Public Transportation Systems *3 Credits*

Electives: 15 Credits

Students will take elective courses in the following areas:

- Management Electives (MG or CE, subject to prerequisites), *6 credits*
- 9 elective courses subject to advisor approval

Note:

[1] Effective Spring 2019. Students entering the MS program prior to Spring 2019 may take TR-GY 6011 Fundamental Concepts in Transportation *1.5 Credits* and TR-GY 6211 Economic Analysis of Transportation Alternatives *1.5 Credits* in place of TR-GY 6053.

Transportation Planning and Engineering, M.S.

Master of Science in Transportation Planning and Engineering

The MS program has a strong foundation in traffic engineering, transportation planning, transportation economics, public transportation systems and intelligent transportation systems. Students are exposed to a learning atmosphere that provides a meaningful combination of theoretical and practical approaches. Courses include a mix of presentations, workshop and project exercises, and practical problem solutions.

The program focuses on (1) material suited to the issues and projects students will face on the job, so that they are immediately productive; (2) material packaged by the course so that each course provides specific skills and knowledge, enabling the student to be immediately productive; (3) project-based learning in multiple courses, as an underlying approach to teaching the courses and the program; (4) modern tools integrated into the courses, including, but not limited to: Synchro and SIM-Traffic and HCS+; (5) design problems taught through a project/case studies approach; (6) statistics integrated into courses, with moderately advanced skills in Excel and Word expected in all courses (but not explicitly taught).

The program includes a strong focus on the rapidly emerging field of intelligent transportation systems. This field applies telecommunications and information technology to solving a variety of transportation functions, from route guidance systems to automated toll collection systems to the automated highway.

Goals and Objectives

The primary goal of the MS in Transportation Planning and Engineering is to prepare transportation professionals to plan, functionally design, control and operate facilities, systems and services that satisfy the demand for passenger and freight transportation. Specific objectives of the program are to provide the skills necessary to:

- Fundamentally understand the nature and generation of transportation AIMSUN demands;
- Understand the political, policy and economic forces that affect transportation demands and the public framework in which they are addressed;
- Control and operate traffic and other transportation facilities; and
- Apply information technologies to intelligent transportation systems.

Program Requirements

Required Courses: 21 Credits

- TR-GY 6013 Fundamental Concepts in Transportation *3 Credits*
- TR-GY 6113 Forecasting Urban Travel Demand *3 Credits*
- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*
- TR-GY 6333 Transportation & Traffic Concepts *3 Credits*
- TR-GY 6343 Traffic Operations & Control *3 Credits*
- TR-GY 6403 Transportation and Traffic Project *3 Credits* [1]
- TR-GY 7013 Urban Transportation & Logistics Systems *3 Credits*

Electives: Select 9 Credits (see Note 2 below)

- TR-GY 7033 Multimodal Transportation Safety *3 Credits*
- TR-GY 7073 Travel Behavioral Informatics *3 Credits*
- TR-GY 7123 Management of Urban Traffic Congestion *3 Credits*
- TR-GY 7133 Urban Public Transportation Systems *3 Credits*
- TR-GY 7213 Transportation Management *3 Credits*
- TR-GY 7223 Management of Transit Maintenance and Operations *3 Credits*

- TR-GY 7243 Intelligent Transportation Systems: Deployments and Technologies *3 Credits*
- TR-GY 7323 Design of Parking and Terminal Facilities *3 Credits*
- TR-GY 7353 Data-driven Mobility Modeling and Simulation *3 Credits*
- TR-GY 8013 Selected Topics in Transportation I *3 Credits*
  and/or
  TR-GY 8023 Selected Topics in Transportation II *3 Credits*
- TR-GY 8011 Special Topics in Transportation A *1.5 Credits*
  and/or
  TR-GY 8021 Special Topics in Transportation B *1.5 Credits*
- TR-GY 900X Readings in Transportation *Variable Credits*
- TR-GY 997X MS Thesis in Transportation *3 Each Credits*

Notes

[1] Students have the option of doing a 6-credit MS thesis in place of TR-GY 6403 Transportation and Traffic Project plus one elective.

[2] Other electives are allowed besides the ones listed, such as any course at CUSP or other CE courses, or from other schools with permission of advisor.

Doctor of Philosophy

Transportation Planning and Engineering, Ph.D.

Doctor of Philosophy in Transportation Planning and Engineering

The PhD in Transportation is a research-oriented degree intended for those whose goal is a career in basic transportation research and/or teaching at the Institute level or in private research organizations.

Goals and Objectives

The fundamental goal of the PhD in Transportation Planning and Engineering is to develop professionals with strong research skills capable of advancing the profession of transportation planning and engineering through their work. Specific objectives of the program are to provide the skills necessary to:

- develop a strong and deep fundamental knowledge about the profession of transportation planning and engineering;
- develop the knowledge and skills to perform independent fundamental research in transportation planning and engineering;
- produce fundamental research that meaningfully advances the state-of-the-art of the profession of transportation planning and engineering.

Program Requirements

Students pursuing the PhD in Transportation Planning and Engineering generally specialize in one of the following subject areas:

- Transportation planning
- Traffic engineering
- Intelligent transportation systems
- Transportation safety

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

Program Administration

All graduate applications are processed through the civil engineering departmental office, which distributes applications to the graduate coordinator. Graduate program coordinators formally implement admission decisions, in accordance with departmental regulations.

The graduate coordinators consult with the departmental Graduate Committee. All PhD applications are reviewed by the committee, and admissions decisions are made by the committee and implemented by the graduate coordinator.

For each registration, the student's program must be approved by their individual academic adviser .

Admission Criteria to PhD Program

Admission to the PhD in Transportation Planning and Engineering requires an MS in Transportation Planning and Engineering or equivalent, with a GPA of 3.5 or better (on a 0-4 scale).

All applicants are required to submit GRE scores for consideration. Foreign applicants must take the TOEFL examination and submit the results for consideration.

The "equivalent" of the MS degree can be achieved in several ways. The candidate may have an MS degree with a different title that covers substantially the same material. More generally, applicants must demonstrate that they have the equivalent of all undergraduate and master's level course work in order to pursue doctoral level work in the major area. Further, "equivalence" is evaluated based on the totality of the student's undergraduate and graduate record, not course-by-course.

Because admission to a PhD program requires a related MS (or equivalent), those applicants who have not yet achieved a master's degree would normally be admitted as MS students. They are expected to earn an MS degree while completing their major and minor course requirements. In rare cases, an applicant with only a BS degree may be directly admitted into the PhD program with the written approval of the department head and will be required to take all courses needed for the MS degree with an overall GPA of 3.5.

Doctoral Committees

Upon admission, every PhD student is assigned an academic adviser, who is selected by the PhD committee. Any member of the civil engineering faculty can be an academic adviser to a graduate student. In cases where a student is supported on a research contract, the principal investigator of the contract would normally be appointed as the academic adviser for the student. Where a student has a particular research interest and is working with a particular faculty member, the student may request that the faculty member be appointed as academic adviser. In rare cases where 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 transportation program.

In fulfilling their academic requirements, PhD candidates will deal with two advisory committees:

Academic Advisory Committee: The student's academic adviser works out a program of courses to fulfill major and minor requirements for the PhD. The Academic Advisory Committee generally will comprise the academic adviser and one faculty member for each 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.

Dissertation Committee: The Dissertation Committee is formed immediately after the student passes the qualifying examination. It comprises a major adviser, a dissertation adviser and a minor adviser for each minor the student has pursued. Additional faculty members may also be on the Dissertation Committee. The Dissertation Committee may be the same as the Academic Advisory Committee, or may be different. The Dissertation Committee guides the student's course and research work after the student has passed the qualifying examination. The Dissertation Committee must be formally assigned and approved by the department head and filed with the Office of Graduate Academics. The major adviser must be a fulltime faculty member of the Department of Civil and Urban Engineering. The major and dissertation adviser may be the same individual.

Doctoral Degree Requirements

To earn a PhD in Transportation Planning and Engineering, the following requirements must be met:

- Fifty-one credits of graduate 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 3.5 or better on a 0-4 scale).
- Completion and successful defense of a 24-credit dissertation related to the major area of study. Dissertations must consist of original research that meaningfully advances the state-of-art in the subject area of the research 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.
- Completion of two minor areas of study, each consisting of between 9 and 12 credits of graduate work.
- Residency requirements for the PhD in Transportation Planning and Engineering include the 24-credit dissertation. The dissertation advisor has to approve all transferred credits from other institutions.

In satisfying the 51-credit course requirement, the student must satisfy all requirements for the major and minor areas selected, or their equivalent.

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

- Thirty-nine credits of approved graduate course work, not including individual guided studies (readings, projects, theses, etc.) beyond the bachelor's degree, with a cumulative average of 3.5 or better on a 0-4 scale.
- Twenty-one credits of related graduate course work beyond the master's degree, with a cumulative average of 3.5 or better on a 0-4 scale.

Satisfying condition 2 requires that the department accept the student's MS degree *in toto* without regard to its specific content. This requires a recommendation from the department's Graduate Committee and the approval of the department head.

Transfer Credits

Transfer credits for PhD students can be awarded course by course. Alternatively, a MS degree from another institution may be accepted for transfer in toto. The latter requires a recommendation from the department's Graduate Committee and the approval of the department head. Transfer credits are awarded generally at the time of admission and must be approved by the academic adviser, the transportation graduate coordinator and the department head.

Qualifying Examination

Departmental qualifying examinations for the PhD in Transportation Planning and Engineering are given once a year (usually in May or June) and are coordinated with other qualifying examinations in the department. If sufficient demand exists, a second qualifying examination may be scheduled in November or December. Every PhD student must pass a qualifying examination in the major area of study and in any in-department minor areas of study before becoming a candidate for the PhD. Further:

- No student may register for dissertation credits until the Qualifying Examination is passed.
- A Dissertation Committee cannot be formed until the student passes the Qualifying Examination.
- A student may take the Qualifying Examination twice. A third attempt is permitted only with the written recommendation of the Academic Advisory Committee and the approval of department head. In no case may a student take the examination more than three times.
- Students normally take the Qualifying Examination (for the first time) after successfully completing most of their course requirements in the major and in department minor areas of study.

The Qualifying Examination consists of a five-hour written portion and an oral portion of approximately one hour. Both written and oral portions of the examination focus on the student's major and in-department minor. The oral portion may also explore higher-level skill areas required to successfully conduct independent research. Students are deemedto have passed the examination based upon an overall evaluation of the written and oral results. While some students may not be invited to the oral examination if they have done poorly in the written portion, invitation to the orals does not imply that the student has "passed" the written portion of the exam.

The Qualifying Examination is either "passed" or "failed." A letter indicating the result of each examination is placed in the student's graduate file. In rare cases, a student may be deemed to have "conditionally passed" the Qualifying Examination. This conditional status occurs in cases where the student does extremely well in all areas except for a single subject area in which weakness has been noted. Such students must follow a prescribed plan to strengthen their knowledge and skills in the area of weakness and must pass a special examination on the area of weakness within one calendar year. A student who has "conditionally passed" the Qualifying Examination may register for dissertation credits and may form a Dissertation Committee.

All transportation faculty members participate in submitting written problems for the qualifying examination, and in the grading process and in the oral examination. All departmental faculty members are welcome to observe any oral examination and to ask pertinent questions. Each student's Academic Advisory Committee will have the opportunity to review the entire exam before it is administered and may suggest changes if it deems that the examination as presented is an inequitable test of the student's abilities. Recommendations on the results of the examination are submitted by each student's Academic Advisory Committee, augmented by any departmental faculty in the subdisciplines tested.

Dissertation Proposal

Following passage of the Qualifying Examination 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 between 15 and 20 pages long and should address the following specific items:

- Description of the topic
- Literature review sufficient to insure that the work contemplated is original
- Research methodology(ies) to be used
- Data and/or laboratory needs and their availability to the student
- Anticipated outcomes

The Dissertation Proposal must be submitted after one semester of registering full time for dissertation credits, or before 9 credits of dissertation credit are completed.

The Dissertation Proposal is orally presented 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 made available to department faculty at least two weeks (14 calendar days) before the defense.

When the Dissertation Proposal is formally accepted, the Dissertation Adviser enters a letter into the student's graduate file, indicating this acceptance, with a copy of the proposal. While the Dissertation Committee has reasonable flexibility to modify the proposal during the research, any significant change in focus area or methodology requires that an amended Dissertation Proposal be written and formally accepted following the same procedure noted 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 Committee has reviewed the draft dissertation and determined that it is complete and of sufficient quality to be presented and defended. By this time, it is also required that a paper based on the dissertation has been submitted to a peer-reviewed journal for publication, details to be worked out with the dissertation advisor.

The defense is organized and scheduled by the Dissertation Committee. All Institute faculty members are invited to observe and ask questions at all NYU Tandon 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 requesting one in a timely fashion and in no case less than two weeks before the defense.

Urban Infrastructure Systems

Program Director: Ilan Juran

The Department of Civil and Urban Engineering offers a graduate program in Urban Infrastructure Systems, leading to the Master of Science. This program was developed as part of the Institute for Civil Infrastructure Systems (ICIS), supported by the National Science Foundation.

The primary objective of ICIS and of the Urban Infrastructure Systems Program is to educate professionals with both engineering and non-engineering backgrounds to understand and manage major urban infrastructure systems and the problems they pose to society and government. It is not sufficient to have a technical understanding of the engineering aspects of urban infrastructure systems and their components. To manage this sector effectively, professionals must also understand the societal and political contexts that affect them. Issues of public policy, finance, monitoring and maintenance must all be understood more clearly.

This Master of Science program attempts to provide a broader exposure to the range of knowledge and skills needed to play a leading role in infrastructure management in an urban setting. Thus, the program includes elements of engineering and technology, management, economics, finance and public policy.

Goals and Objectives

The specific objectives of the Urban Infrastructure Systems Program are to provide students with the following:

- A broad base of understanding of infrastructure management and policy issues;
- Analytic and decision-making skills that account for the political, economic and social impacts of infrastructure technologies;

- A broad overview of the full range of urban infrastructure systems;
- An integrated knowledge of the interactions and interdependencies of various urban infrastructure systems;
- Specialized management skills and techniques to apply to unique problems of the infrastructure segment.

Admission Requirements

Admission to the MS in Urban Infrastructure Systems is open to professionals with BS or BA degrees and backgrounds in engineering, science, public policy, management, economics and/or finance. Necessary mathematics background, usually including undergraduate calculus, is required, as is an undergraduate GPA of 3.0 or better.

Grade Requirements

To earn graduate degrees or certificates, students must have a 3.0 GPA or better in all graduate courses and guided studies (readings, projects, theses, dissertations). Averages are separately computed for courses and guided studies. Transfer credits from other institutions are not included in this average.

Analytical Background

All applicants for this MS program must show evidence of quantitative analytic ability, generally, including a minimum of two years of college mathematics and a college-level course in statistics.

Transfer Credits

The residency requirement for the MS degree is 21 credits. This is the minimum number of credits that must be taken at the NYU Tandon School of Engineering for an MS degree.

Students may transfer up to 9 credits of acceptable courses toward an MS degree, subject to the approval of the academic adviser. To be transferred, the course(s) must be relevant to the program and from an acceptable institution. A grade of B or better is required for granting of transfer credit. Courses graded on a pass/fail basis are not considered for transfer unless accompanied by a detailed written evaluation by the course instructor. All transfer requests must be accompanied by an official transcript from the transferring institution. Applications for transfer credits are accepted only after the student has earned 12 credits at the NYU Tandon School of Engineering.

Advising

Each student in the graduate program is assigned a faculty adviser. It is important that students maintain frequent contact with the adviser throughout their studies. Students must meet with their academic adviser before each registration and at any other time they need advice or consultation.

Students must have a detailed program of study formally approved by their adviser before registration. Advisers also handle requests for waiver of certain degree requirements, where warranted. Such waivers must be approved in writing and must be entered into the student's departmental file. Where specific courses are waived, the approval of the course instructor is also required. When waivers are granted, students may be required take other specific courses in their place, or to select additional electives.

Students registering for any guided studies (readings, projects, theses) are assigned project advisers for each such activity. The project adviser may or may not be the same as the student's academic adviser, depending upon the subject matter selected. To register for any guided study activity, students must submit written proposals for the topic(s) to be covered to a project adviser before registration. To register, the written approval of the project adviser is required in addition to the approval of the academic adviser.

While academic advisers consult and advise students, students are responsible for ensuring that all degree requirements are fulfilled and for submitting all proper forms and application.

Master of Science

Urban Infrastructure Systems, M.S.

With the fast growth of urban population local governments, public service agencies, and urban utilities presently face increasing public demand for greater reliability, safety, affordability and resiliency of the aging urban infrastructure systems. These systems have to be continuously adapted and upgraded (often with technology-driven solutions) to efficiently support the essential public services, urban development and economic growth.

The infrastructure systems support a variety of urban sectors, including transportation, energy & water supply, sanitation & wastewater management, public buildings, district heating, public health & safety, waste management, telecommunication and other essential services. Their sustainable development engages a wide variety of public and private sector stakeholders and greatly depends on a broad range of institutional, environmental, economic, societal and operational factors. Such factors include public policy objectives, land use and geo-physical system characteristics, regulatory requirements, environmental issues, availability of renewable resources, customers' awareness and culture, management capabilities, and other operational state variables. With rising societal concerns with regard to climate change impact, environmental sustainability and economic viability of the fast-growing urban centers, both Government and Industry presently face increasing needs for innovative capabilities of dynamic monitoring and "smart" system control to effectively meet the challenge of upgrading the aging urban infrastructure systems.

Facing these urban sustainability challenges, recent developments of Information Technology based "smart" infrastructure monitoring and control capabilities have been increasingly integrated in operation system optimization, early incident detection and proactive mitigation, for upgrading the operational efficiency, safety and service quality of the infrastructure systems. These innovative solutions are currently driving a significant paradigm shift from reactive to preemptive engineering and management of these urban systems, across the wide array of public service sectors that they support. The infrastructure industry development goal is to provide the engineers and managers of the urban systems with upgraded decision making capabilities to better cope with the growing environmental risks, economic constraints, and complex operational uncertainties and effectively respond to the growing societal demand.

The interdisciplinary MS Program in Urban Infrastructure Systems targets the development of a broad understanding of the infrastructure management challenges facing metropolitan governments and urban utilities. Cutting across different disciplines of engineering, infrastructure financing, environmental policy and planning, the program is focused on the needs and methodologies for integrating policy decision making, intelligent technology solutions, and risk-based system analysis in urban infrastructure systems management to effectively meet the emerging challenges of sustainable urban developments. Following five core courses, students may select an area of specialization in a specific urban sector, as indicated in the list of proposed majors. They are also required to complete a 3-credit Capstone project or a 6-credit Master Thesis.

With specialized faculty members from Government, Industry and Academia, the program is designed for professionals, with both engineering and non-engineering backgrounds, who are involved and/or interested in the fast growing interdisciplinary field of urban systems management and career opportunities with government agencies, public and private sector utilities, and service industries across the wide array of the metropolitan sectors.

To accomplish these objectives the program includes:

- Core courses (5 courses, 3 credits each) related to challenges of infrastructure management strategies across the sectors.
- Majors (3 to 4 courses, 3 credits each) related to infrastructure management strategies for selected urban sectors, including: Urban Transportation Planning & Management, Urban Water Supply & Environmental Systems management, Smart Building & Energy Supply, Urban Construction Engineering & Management and Infrastructure Systems Planning & Management.
- Interdisciplinary Capstone Project (3 credits) or MS Research Thesis (6 credits) on a selected topic.

Requirements for the Master of Science

Program Core: 15 Credits

All students must complete the following five courses [1]:

- CE-GY 7813 Infrastructure Planning, Engineering and Economics *3 Credits*
- CE-GY 7843 Urban Infrastructure Systems Management *3 Credits*
- CE-GY 7853 Infrastructure Asset Management *3 Credits*
- CE-GY 7673 Environmental Impact Assessment *3 Credits*
- CE-GY 8733 Infrastructure Financing: Structuring of a Deal *3 Credits* [2]

Note:

[1] Core courses can be substituted by other selected courses upon approval of the academic advisor.

[2] Course is part of the Exec 21 program; special requirements (see Construction Management Program) or permission of adviser required.

Minor, Technical and Free Electives:

Each minor area of study includes: (1) three minor courses, required for the minor; and (2) two to three technical electives, available to all program students.

Students may elect not to take a specified minor area. They may, instead, take five or six technical electives from the approved list in any specified area. The number of technical electives is influenced by whether the student elects to do a 3-credit case study report or a 6-credit MS thesis, as described in a later section.

Minor Areas of Concentration

- Transportation Systems Management (TSM)
- Construction Management (CM)
- Environmental Systems Management (ESM)
- Civil Infrastructure Systems Management (CISM)

Because of course content, students selecting the CISM minor should hold a BS in Civil Engineering or the equivalent.

Minor in Transportation Systems Management

Credits required in the minor:

- TR-GY 7223 Management of Transit Maintenance and Operations *3 Credits*
- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*
- TR-GY 7133 Urban Public Transportation Systems *3 Credits*

Approved Technical Electives in Transportation

- TR 6133 Travel Demand Forecasting *3 Credits*
- TR-GY 7123 Management of Urban Traffic Congestion *3 Credits*

Note:

Additional electives may be approved by the adviser.

Minor in Construction Management

Required in Minor:

- CE-GY 8253 Project Management for Construction *3 Credits*
- CE-GY 8713 Construction and the Law *3 Credits* [2]
- CE-GY 8723 How to Succeed in Construction *3 Credits* [2]

Note:

[2] *Course is part of the Exec 21 program; special requirements (see Construction Management Program) or permission of adviser required.*

Approved Technical Electives in Construction:

- CE-GY 8273 Contracts and Specifications *3 Credits*
- CE-GY 8783 Construction Management and Planning *3 Credits* [2]
- CE-GY 8703 Managing and Leading in the 21st Century *3 Credits* [2]

Note:

Additional electives may be approved by the adviser.

[2] *Course is part of the Exec 21 program; special requirements (see Construction Management Program) or permission of adviser required.*

Minor in Environmental Systems Management

Credits required in the minor:

- CE-GY 7753 Environmental Systems Management *3 Credits*
- CE-GY 7533 Hazardous/Toxic Waste Management *3 Credits*
- CE-GY 7563 Environmental Law *3 Credits*

Approved Technical Electives in Environmental Studies:

- CE-GY 7473 Modeling Fate and Transport of Surface Water Pollution *3 Credits*
- CE-GY 7523 Air Pollution *3 Credits*
- CE-GY 7543 Site Remediation *3 Credits*
- CE-GY 6053 Monitoring Cities *3 Credits*

Note:

Additional electives may be approved by the adviser.

Minor in Civil Infrastructure Systems Management

Recommended courses which can be substituted upon approval of the academic advisor:

- CE-GY 7863 Infrastructure Monitoring and Performance Assessment *3 Credits*
- CE-GY 6063 Bridge Engineering *3 Credits*
- CE-GY 8433 Urban Geotechnology *3 Credits*

Approved Technical Electives in Infrastructure Systems:

- CE-GY 6143 Steel Structures *3 Credits*
- CE-GY 8433 Urban Geotechnology *3 Credits*
- CE-GY 8493 Environmental Geotechnology *3 Credits*

Note:

Additional electives may be approved by the adviser.

Capstone Experience

Students fulfill the requirement for a meaningful Capstone experience by completing an independent case study in urban infrastructure systems (3 credits) or a master's thesis on a topic of independent study (6 credits).

All course descriptions for Urban Infrastructure Systems are found in the Civil Engineering section of this catalog.

Department of Computer Science and Engineering

Chair: Guido Gerig

Mission Statement

The Department of Computer Science and Engineering is committed to preparing undergraduate and graduate students for leadership roles in professional and research activities in the information-technology sector. The department fosters an environment that encourages lifelong learning in the Information Age. Graduates lead and grow in diverse working environments and apply the theories and skills of computer science to real-world problems. Toward this end, the department conducts state-of-the-art research in theoretical and applied computer science and maintains strong educational programs that emphasize breadth and depth in technical knowledge and proficiency in spoken and written communication skills. The environment encourages Invention, Innovation and Entrepreneurship (i^2e).

The Department

Computers are now used in practically every area of human endeavor and are radically changing both the way people live and how they view the limits of human capabilities. Job opportunities in computer science and engineering are challenging and diverse. According to the U.S. Bureau of Labor Statistics, current job growth in computer science is among the highest of any technical profession.

NYU Tandon's Department of Computer Science and Engineering offers programs leading to a BS, MS and PhD in Computer Science, and an MS in Cybersecurity. The department offers joint programs with the Department of Electrical and Computer Engineering, leading to a Computer Engineering, B.S., and the NYU School of Law, leading to a Cybersecurity Risk and Strategy, M.S. (Offered jointly by the NYU School of Law and NYU Tandon School of Engineering) The department also offers an advanced certificate in software engineering and cybersecurity and minors in Computer Science and Game Engineering.

The department is active in research in several key areas of computer science. Its particular strengths are in security and privacy; big data analysis and visualization; computer vision, game engineering; and algorithms and theoretical computer science.

The security and privacy concentration-also including cybersecurity, one of the largest growing fields in computer science-has research strengths in peer-to-peer security, digital forensics, biometrics, wireless security, and usable security. Big data analysis is strong in data management, computing, analyzing, and visualizing urban, scientific, and Web data. Computer vision puts a primary focus on medical image analysis. Game engineering focuses on computer graphics and perceptual science as well as artificial intelligence in gaming and player modeling. Finally, theoretical computer science is based in computational and discrete geometry, data structures, and machine learning.

The CSE department is at the center of a high-tech start-up culture where student and faculty innovation and entrepreneurship activities are supported and nurtured both in New York City, Brooklyn and across the NYU Global Network University. The faculty works closely with NYU Tandon's Center for Advanced Technology in Telecommunications (CATT) and has relationships with industries that support research and activity in their special interests.

NYU Tandon School of Engineering has been designated as a Center of Excellence for Information Assurance Education for research by the National Security Agency (NSA) and operates the Scholarship for Service Program (SFS) in Information Assurance.

The department provides students with a wide variety of advanced computer and software systems. These support PC and UNIX technology along with highly distributed networks. The department has four dedicated computer-science laboratories (virtual lab) for upper-level undergraduate students. They are the Software Engineering Laboratory, Parallel and Distributed Systems Laboratory, Visualization and Graphics Laboratory and Computer System and Security Integration Laboratory. Multimedia and Web-based laboratories are also available.

Contact

NYU Tandon School of Engineering
Computer Science and Engineering Department
370 Jay Street, 8th floor, rm 851
Brooklyn, NY 11201

Tel: (646) 997-3440
Web: http://engineering.nyu.edu/academics/departments/computer-science-engineering

Degrees Offered

Bachelor of Science

- Computer Engineering, B.S. offered by the Computer Engineering Program
- Computer Science, B.S.
- Computer Science Minor
- Game Engineering Minor

Master of Science

- Computer Science, M.S.
- Cybersecurity, M.S.
- Cybersecurity Risk and Strategy, M.S. (Offered jointly by the NYU School of Law and NYU Tandon School of Engineering)

Doctor of Philosophy

- Computer Science, Ph.D.

Undergraduate Programs

For undergraduates, the department offers two degrees: a Bachelors of Science in Computer Science (BS CS) and a Bachelors of Science in Computer Engineering (BS CompE). The Bachelor of Science in Computer Science is a rigorous program that not only covers fundamental computer science subjects, such as object-oriented programming, computer architecture and operating systems, but also provides a number of exciting avenues for specialization including computer and online game development, cyber security, Internet/web systems and applications, bioinformatics, graphics and vision, digital media and management and entrepreneurship. Strong students can also apply to the BS/MS Program where it's possible to earn the BS and MS in computer science within approximately 5 years.

The department jointly administers the Bachelors of Science in Computer Engineering with the Department of Electrical and Computer Engineering. It draws on the two departments' strengths to provide a focus on computer system design with integrated understanding of computer hardware and software.

Master's Programs

The MS in Computer Science permits students to take courses either on a full-time or part-time basis. The curriculum has been designed for maximum flexibility. It includes fundamental courses in computer science as well as electives in specialized advanced courses on topics including computer and network security, distributed systems and networking, computer graphics, computer vision, databases and web search technology. By electing the masters-thesis option, students may also pursue research with faculty members who are internationally recognized in their fields.

The MS in Cybersecurity is a highly innovative program that provides students with the critical knowledge and skills to become experts in cybersecurity, the science of protecting vital computer networks and electronic infrastructures from attacks. The program responds to the growing demand for security specialists in industry as well as government organizations.

PhD Program

The PhD program develops graduate skills in a broad range of areas as well as expertise in one or more specific areas and the ability to think critically and conduct independent research. Outstanding PhD students are advised to apply for financial aid in the form of teaching assistantships, research assistantships or partial-tuition remission.

Faculty

Professors

Boris Aronov
PhD, Courant Institute of Mathematical Sciences, New York University
Algorithms, computational and combinatorial geometry

Juan Pablo Bello
PhD, Queen Mary, University of London
Digital signal processing, machine listening and music information retrieval, sound and music informatics

Juliana Freire
PhD, State University of New York at Stony Brook
Data analysis and visualization, Big Data, provenance management and analytics, scientific data management, large scale information, web information retrieval and analysis, web crawling, hidden web

Guido Gerig, Department Chair
PhD, Swiss Federal Institute of Technology Zurich (ETH-Z)
Image processing & analysis, medical image processing, 3D computer vision, shape analysis, spatiotemporal modeling

Lisa Hellerstein
PhD, University of California at Berkeley
Computational learning theory, machine learning, algorithms, complexity theory, discrete mathematics

Nasir Memon
PhD, University of Nebraska
Data compression, image and video processing, computer security, multimedia computation and communication

Shan Muthukrishnan
PhD, New York University
Design and analysis of algorithms, in particular, analyzing Big Data streams, Inter-net advertising, and algorithmic issues in databases and networking

Keith W. Ross, Leonard J. Shustek Distinguished Professor
PhD, University of Michigan
Computer networking, Internet research, multimedia networking, scholastic modeling

Claudio T. Silva
PhD, State University of New York at Stony Brook
Big Data and Urban Systems, Visualization and Data Analysis, Geometry Processing

Torsten Suel
PhD, University of Texas at Austin
Design and analysis of algorithms, database systems, parallel computation, experimental algorithmics

Paul Torrens
PhD, University College London
Development and application of modeling and simulation tools for exploring and explaining complex urban systems

Associate Professors

Enrico Bertini
PhD, Sapienza University of Rome
Information Visualization, Human Computer Interaction

Justin Cappos
PhD, University of Arizona
Practical security, virtualization, cloud computing, software update systems, testbeds

Yi-Jen Chiang
PhD, Brown University
Computer graphics: out-of-core scientific visualization, isosurface extraction, surface simplification, virtual reality, air traffic control. Computer algorithms: I/O algorithms, computational geometry, graph algorithms, approximation algorithms, data structures

Rachel Greenstadt
PhD, Harvard University
Designing more trustworthy intelligent systems via highly interdisciplinary approach by incorporating ideas from artificial intelligence, psychology, economics, data privacy, and system security

Damon McCoy
PhD, University of Colorado, Boulder
Security and privacy of large-scale systems

Julian Togelius
PhD, University of Essex
AI, player modeling, procedural content generation, automatic game design, believable bot behavior, coevolution, neuroevolution, genetic programming and monte carlo tree search

Edward K. Wong, Associate Professor of Computer Science
PhD, Purdue University
Computer vision, image analysis, pattern recognition, computer graphics

Assistant Professors

Rumi Chunara
PhD, Harvard University
Information retrieval, spatio-temporal analyses, data mining, machine learning and epidemiological methods for new data sources

Brendan Dolan-Gavitt
PhD, Georgia Institute of Technology
Program analysis, virtualization security, memory forensics, and embedded and cyber-physical systems

Chinmay Hedge
PhD, Rice University
Machine Learning, Algorithms, Big Data, Signal and Image Processing

Christopher Musco
PhD, MIT
Scalable machine learning, foundations of data science, numerical linear algebra, theory of algorithms, randomized algorithms, sketching and streaming

Julia Stoyanovich
PhD, Columbia University
Responsible data management and analysis practices

Industry Faculty

Greg Aloupis
PhD, McGill University
Algorithms

Eugene Callahan
PhD, Cardiff University
Agent-based modeling, DevOps, Agile courseware

Peter DePasquale
PhD, Virginia Polytechnic
Computer Science Education, Cloud Computing, Web Development and Security

Jeffrey Epstein
Cambridge University
Computer Science Education, Cloud Computing, Web Development and Security

Thomas Reddington
MS Physics, University of Pittsburgh, PA
Networking and networking security

Darryl Reeves
PhD, Cornell University
Computational biology, machine learning

Gustavo Sandoval
MS, California State University at Sacramento
Machine Learning, Distributed Systems, Operating Systems, Mobile applications, and Project Management

Linda Sellie
Machine Learning

John B. Sterling
MS, New York University
Game programming, software development

Fred J. Strauss, Director of CSE programs in Melville Campus-Long Island
MS, Polytechnic Institute of New York
Software engineering, project management, distributed systems

Itay Tal
MS, Tel-Aviv University

Lecturers

Daniel Katz-Braunschweig
MS, Iona College
Senior Lecturer

Faculty Emeriti

Phyllis G. Frankl
PhD, New York University
Software analysis and testing

Haldun Hadimioglu
PhD, Polytechnic University
Computer architecture, parallel processing, reconfigurable systems and application specific processors

K. Ming Leung
PhD, University of Wisconsin
Scientific computing, computer simulation, neural networks

Computer Science

Program Director: Torsten Suel

Computer science examines the theory and practice of designing, building and using computers. The field includes the design and analysis of algorithms, principles of programming languages and compilers, operating systems, software engineering, artificial intelligence, computer organization and architecture, computational geometry, database systems, parallel and distributed computing, and image analysis and understanding. The Computer Science Program is administered by the Department of Computer Science and Engineering.

Elective Offerings

The following table lists electives offered by the Computer Science and Engineering department. They consist of undergraduate courses as well as graduate courses open to undergraduates.

Undergraduate Courses

- CS-UY 2053 Assembly Language *3 Credits*
- CS-UY 3393 UNIX System Programming *3 Credits*
- CS-UY 3083 Introduction to Databases *3 Credits*
- CS-UY 3913 Java and Web Design *3 Credits*
- CS-UY 3923 Computer Security *3 Credits*
- CS-UY 3933 Network Security *3 Credits*
- CS-UY 394X Special Topics in Computer Science *Variable Credits*
- CS-UY 2204 Digital Logic and State Machine Design *4 Credits*
- CS-UY 3254 Introduction to Parallel and Distributed Systems *4 Credits*
- ECE-UY 3613 Communication Networks *3 Credits*
- MA-UY 4424 Numerical Analysis *4 Credits*

Graduate Courses

To enroll in graduate courses juniors and seniors must have a 3.0 GPA or better and adviser approval.

(open to undergraduates)

- CS-GY 6093 Advanced Database Systems *3 Credits*
- CS-GY 6913 Web Search Engines *3 Credits*
- CS-GY 6273 Performance Evaluation of Computer Systems *3 Credits*
- CS-GY 6533 Interactive Computer Graphics *3 Credits*
- CS-GY 6613 Artificial Intelligence I *3 Credits*
- CS-GY 6643 Computer Vision *3 Credits*
- CS-GY 6673 Neural Network Computing *3 Credits*
- CS-GY 6843 Computer Networking *3 Credits*
- CS 9013 Selected Topics in Computer Science *3 Credits*
- CS-GY 9023 Web Technologies and Integrated Environments *3 Credits*
- CS-GY 9033 Web Services and SOA *3 Credits*
- CS 9043 Cryptography with Financial Applications *3 Credits*
- CS 9053 Introduction to Java *3 Credits*
- CS 9073 Human Computer Interaction *3 Credits*
- CS-GY 9093 Biometrics *3 Credits*
- CS 9103 Object Oriented Design in Java *3 Credits*
- CS-GY 6923 Machine Learning *3 Credits*
- CS 9153 Game Programming *3 Credits*
- CS-GY 9163 Application Security *3 Credits*
- CS-GY 9963 Advanced Project in Computer Science *3 Credits*
- ECE-GY 6473 Introduction to VLSI System Design *3 Credits*

Transfer Students

Transfer students are accepted into the undergraduate Computer Science Program on the same basis described in the admissions section of this catalog. In addition, the department requires that at least 28 credits in computer science, as well as CS-UY 4513 and CS-UY 4523, be completed at NYU Tandon. Graduates of technology programs may be able to fulfill the requirements for the BS in Computer Science in two to three and one-half years, depending on the scope and level of their previous education. Students should consult an undergraduate adviser for details.

Courses taken at other schools may be granted transfer credit after an evaluation of the content and level of material covered. Periodic re-evaluation of courses taken at other institutions may lead to a variation in the number of credits granted year to year. Thus, students completing the same program, but in different years, may receive different numbers of transfer credit. Students should consult a computer science undergraduate adviser for current information. All computer science courses are evaluated by the Department of Computer Science and Engineering. Transfer students exempted from EG-UY 1003 Introduction to Engineering and Design, must take a substitute course that includes the preparation of presentations. Students should meet with their undergraduate adviser for more information.

Departmental Standards, Probation and Grades of I (Incomplete)

To remain in good academic standing, computer-science majors must satisfy the requirements listed below in addition to maintaining a minimum cumulative GPA of 2.0 in all courses.

The following requirements apply to all undergraduate computer science students:

1. Students must maintain an average of C (2.0 GPA) or better in CS.
2. Students must earn a grade of C- or better in the following courses: Calculus I (MA-UY 1024); Calculus II (MA-UY 1124); Introduction to Programming and Problem Solving (CS-UY 1114); Data Structures and Algorithms (CS-UY 1134); and Object Oriented Programming (CS-UY 2124).
3. Students may repeat a course in which they earned a substandard grade, but no CS course may be taken more than three times (grades of W and AUDIT are not counted for the purpose of this rule).
4. A course in which the student received an incomplete (I) grade may not be used to satisfy any prerequisites until the incomplete is resolved. See "Policies on Undergraduate Grading and Grades" in the "Academic Policies and Degree Requirements" section of this catalog for additional information on incomplete grades.

Students failing to meet any of the above requirements are placed on departmental probation as a warning that they are not progressing acceptably toward their degree. Repeated failure to meet probation requirements may lead to disqualification from the undergraduate computer science program and courses.

Information

For more information related to curriculum and prerequisite changes, new courses, special sections and other last minute announcements go to the Computer Science and Engineering's website.

Graduate Programs Goals and Objectives

MS in Computer Science

The goals and objectives of the Master of Science in Computer Science program are to provide students with the following:

- Maximum curriculum flexibility, allowing students to adapt their program to their ambitions and goals as well as to their educational and professional backgrounds;
- A solid grounding in computer-science fundamentals;
- Professional-level courses in computer science;
- Opportunity to specialize in selected technology areas of utmost interest; and
- Opportunities for a research-oriented program, in preparation for the PhD program in computer science.

Requirements for MS in Computer Science

Entrance Requirements
For entrance into the Master of Science degree programs, students are required to have an undergraduate degree in computer science, mathematics, science or engineering, with a superior undergraduate record from an accredited institution. Applicants with degrees in other fields are considered individually for admission. Generally, entering students are expected to know mathematics through calculus.

Additional Entrance Requirements

1. At least one year of university-level science.
2. A working knowledge of a high-level, general-purpose programming language (preferably C++).

3. A basic understanding of computer fundamentals such as computer organization and operation, data structures and computer architecture. Students entering with a bachelor's in computer science or with a bachelor's in a technical area and a strong minor in computer science should be able to satisfy entrance requirements for the master's degree program. Students who have superior academic credentials but who lack sufficient background are admitted with conditional status, pending satisfactory completion of several individually specified preparatory courses. In some cases, such students are interviewed to determine the preparatory courses they need to complete. Successful completion of the preparatory courses with a B or better average grade is a necessary condition for transfer to regular status. The demonstrated ability to communicate in written and spoken English is essential for success in pursuing graduate studies in computer science and information-systems engineering; such fluency is required for regular status. Foreign students and others for whom English is a second language may be required to undertake preparatory work to improve their language skills. Admission with advanced standing is accepted in accordance with NYU Tandon regulations published in the catalog. A maximum of 9 credits may be applied to the MS degree from previous graduate work at an acceptable institution.

Preparatory Courses

The Department of Computer Science and Engineering offers two preparatory bridge courses for students without a working knowledge of a high-level, general-purpose programming language:

- CS-GY 5303 Introduction to Programming and Problem Solving
- CS-GY 5403 Data Structures and Algorithms

Master's Thesis

Exceptional students may elect to write a master's thesis, for which no more than 6 credits may be earned toward the degree. Such students should find an adviser who agrees to monitor the thesis research. Such research need not be original, but should demonstrate adequately the student's proficiency in the subject. An oral defense of the master's thesis before at least three professors is required.

PhD Program in Computer Science

Graduate students who exhibit a high degree of scholastic proficiency and demonstrate an ability for independent scholarship may consider extending their goals toward the degree of Doctor of Philosophy.

Non-Degree

Computer Science Minor

The minor in Computer Science consists of a minimum of 15 credits including CS-UY 1134 and CS-UY 2124.[1] Students must obtain a grade of C- or better in CS-UY 1114 (Intro. to Programming and Problem Solving) or CS-UY 1123 Problem Solving and Programming II or a grade of A- or better in CS-UY 1133 or permission of the department and satisfy the pre-requisite requirements before enrolling in these courses.[2]

Students must maintain an average of 2.0 or better in the entire minor. In addition, a required CS course in a BS curriculum cannot be used to satisfy the course requirements in the CS minor. For transfer students, a least three of the five courses must be taken at the NYU Tandon School of Engineering.

For more information about the minor, contact the Computer Science Department's undergraduate academic adviser.

[1] Students who entered NYU Tandon prior to FA16 may take CS-UY 1124 Object Oriented Programming and CS-UY 2134 Data Structures and Algorithms instead of CS-UY 1134 and CS-UY 2124.

[2] CS-UY 1113, 1123, 1114, and CS-UY 1133 do not count toward the minor requirements.

Game Engineering Minor

Introduction

With the increased use of mobile and tablet devices, the global video game market, valued at $78 Billion in 2012*, is experiencing unprecedented growth. Game designers and programmers are in higher demand than ever. As the industry grows and develops, so does our commitment to giving our students full access to the technology and leading information necessary for them to dive headfirst into this exciting area. Imagine working with cutting-edge technology to create one of the world's newest and most popular forms of entertainment. Our Game Engineering Minor gives you that opportunity.

Research at the Game Innovation Lab

The NYU Tandon School of Engineering's Game Innovation Lab provides a dynamic and engaging environment for faculty and the students they mentor to conduct innovative interdisciplinary research on the technical/engineering/science side of games and simulations. Working with industry partners and research facilities internationally, the lab provides opportunities for graduate students (and a handful of advanced undergraduates) who aspire to challenge convention and break barriers within the industry. Sample projects include games with advanced user interface techniques (a surveillance camera-enabled public game, an award-winning smart-phone-based dance battle game), automatic rigging of 3D models, research on games for learning, and playful interfaces for security and authentication purposes.

Prerequisites

Students are required to complete a minimal core curriculum in Computer Science (CS) before enrolling in the minor (or demonstrate equivalent mastery), in order to be well prepared for the game engineering coursework, as well as a Calculus course. Students completing the minor from outside of the NYU Tandon School of Engineering CS major program can request permission to apply a portion of these prerequisite credits to the overall credit total for the minor. At most six credits of the following courses may be applied to the minor (substituting for the University-wide elective and one of the core electives), provided they or an equivalent course **are not required** as part of the students major.

- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- CS-UY 1134 Data Structures and Algorithms *4 Credits* *
- CS-UY 1113 Problem Solving and Programming I *3 Credits*
- CS-UY 1123 Problem Solving and Programming II *3 Credits*
- CS-UY 2124 Object Oriented Programming *4 Credits* *

  ***Note:** Students who entered NYU Tandon prior to FA16 may take CS-UY 1124 Object Oriented Programming and CS-UY 2134 Data Structures and Algorithms instead of CS-UY 1134 and CS-UY 2124.

Curriculum

The Game Engineering Minor emphasizes mastery of computer programming skills relevant to Game Engineering, combined with hands-on practice building games with other in studio-style courses, and electives drawn from NYU's broad offerings in the games domain. Students are also expected to complete a prerequisite core curriculum in Computer Science (CS) to be well prepared for the other courses (or to demontrate equivalent mastery).

Course Distribution

The minor consists of 15 credits. Each course taken may fulfill *either* a core *or* an elective requirement.

Core Course:

- CS-UY 3113 Game Programming *3 Credits* (all students are required to take this course)

Studio Requirement: (choose 1)

- CS-UY 3233 Game Development Studio I *3 Credits*
- CS-UY 4553 Game Design *3 Credits*
- OART-UT 1612 Game Development *3 Credits* (Tisch School of the Arts Game Center)

Core Electives: (choose 2)

Students must take two additional game engineering courses within the NYU Tandon School of Engineering CS curriculum (or equivalent courses from other NYU departments - approval required).

- CS-UY 4533 Interactive Computer Graphics *3 Credits*
- CS-UY 4543 Human Computer Interaction *3 Credits*
- CS-UY 4553 Game Design *3 Credits*
- CS-UY 4613 Artificial Intelligence *3 Credits*

University-wide Electives: (choose 1)

Students may take an additional Core Elective, or submit another Game Engineering-related elective for approval by the Director of the Game Engineering Minor as part of their minor. The Director of the Game Engineering Minor will maintain a list of currently approved electives. Here is a *sample* of relevant NYU-wide electives:

- 3D Graphics Studio I in NYU Engineering's Digital Media program *3 Credits*
- Introduction to Game Design, Game Development Project Studio, and Games 101 in the Tisch School of the Arts Game Center *3 Credits*
- Designing Simultations and Games for Learning in the Steinhardt Digital Media and Design for Learning program *3 Credits*
- Social Multiplayer Games and Computer Games in the Courant Institute Computer Science Department *3 Credits*

Bachelor of Science

Computer Science, B.S.

Undergraduate Program

Computer science focuses on how to design, build, and effectively use the computers and systems that we interact with every day from the smart phones in our hands to the complex databases in our banks and hospitals. Because computer technology powers the most essential functions of business, industry, government and entertainment, computer scientists have tremendous opportunities for growth and exploration.

In addition to the BS degree in Computer Science, the Computer Science and Engineering department offers minors in Computer Science, Cybersecurity, and Game Engineering. The NYU Tandon School of Engineering also offers a BS/MS Program that enables students to earn both a BS and an MS degree at the same time. For instance, a student can receive a BS in Computer Science and MS in Computer Science, a BS in Computer Engineering and MS in Computer Science, or a BS in Electrical Engineering and MS in Computer Science. Depending on the student's preparation and objectives, they can complete both degrees within 5 years. More information on the BS/MS program can be found on the "Undergraduate Academic Requirements and Policies" section of the catalog.

The program provides research labs for specialized study in areas such as cybersecurity, game engineering, and big data, areas in which our department has a distinctive strength. In addition, the program's close ties to our graduate division immerse students in a vibrant, intellectual atmosphere.

Goals and Objectives

With the BS program in Computer Science, the department aims to:

- Provide a deep understanding of fundamental computer science subjects;
- Provide avenues of specialization, such as digital games, cybersecurity, and computer systems;
- Achieve a proper balance between theoretical study and practical design in order to solve problems effectively;
- Supplement technical skills with courses in humanities, social science, and business; and
- Provide opportunities for excellent students to pursue independent study, as well as directed research, with faculty members who are internationally recognized in their fields.

Curriculum Overview

Below is an overview of the Computer Science BS curriculum. A typical course schedule is located at the end of this section.

Computer Science Introductory Sequence

- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- CS-UY 1134 Data Structures and Algorithms *4 Credits*
- CS-UY 2124 Object Oriented Programming *4 Credits*

Other Required Computer Science Courses

- CS-UY 1122 Introduction to Computer Science *2 Credits*
- CS-UY 2214 Computer Architecture and Organization *4 Credits*
- CS-UY 3224 Operating Systems *4 Credits*
- CS-UY 2413 Design and Analysis of Algorithms *3 Credits*

- CS-UY 4513 Software Engineering *3 Credits*
- CS-UY 4523 Design Project *3 Credits*

Required Mathematics Courses

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*
- MA-UY 2314 Discrete Mathematics *4 Credits*
- MA-UY 2224 Data Analysis *4 Credits*
  Note: *MA-UY 914 Precalculus for Engineers does not count toward the Math requirement.*
  Note: MA 2034 Linear Algebra and Differential Equations or another linear algebra course is recommended, but not required. Some CS electives have knowledge of linear algebra as a prerequisite. Students planning to take such electives should plan accordingly.

Required Engineering Courses

- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*

Science Requirement

Students may choose any three natural science courses (each at least 3 credits) offered by the NYU Tandon School of Engineering, provided that they meet pre-requisites and co-requisites:

- BMS-UY 1004 Introduction to Cell and Molecular Biology *4 Credits*
- BMS-UY 2004 Introduction to Physiology *4 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- CM-UY 1014 General Chemistry I *4 Credits*
- CM-UY 1024 General Chemistry II *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits* and PH-UY 2121 General Physics Laboratory I *1 Credit*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits* and PH-UY 2131 General Physics Laboratory II *(1 Credit)*

Humanities and Social Sciences Requirement

Students are required to take six courses in humanities and social sciences. Two of these courses are specified below; the remaining four courses are electives, one of which must be a writing-intensive course (denoted by a "W" in the course number) and one must be an ethics course.

- EXPOS-UA 1 Writing the Essay *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- Any Ethics course *4 credits*

Electives

- 18 additional credits in computer science electives [4]

- 26 credits of free electives [4]

Note**:** *NYU SPS courses are not accepted as free electives.*

Typical Course of Study for the Bachelor of Science in Computer Science

Freshman Year

Fall Semester: 16 Credits

- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits* [1]
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits* [2]
- MA-UY 1024 Calculus I for Engineers *4 Credits* [3]
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*

Spring Semester: 17 Credits

- CS-UY 1134 Data Structures and Algorithms *4 Credits* [1]
- CS-UY 1122 Introduction to Computer Science *2 Credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- Science Elective *3 Credits* [3]

Sophomore Year

Fall Semester: 15 Credits

- CS-UY 2124 Object Oriented Programming *4 Credits* [1]
- MA-UY 2314 Discrete Mathematics *4 Credits*
- Science Elective *3 Credits* [4]
- Humanities and Social Sciences Elective *4 Credits* [5]

Spring Semester: 15 Credits

- CS-UY 2214 Computer Architecture and Organization *4 Credits*
- CS-UY 2413 Design and Analysis of Algorithms *3 Credits*
- MA-UY 2224 Data Analysis *4 Credits* [7]
- Humanities and Social Sciences Elective *4 Credits* [5]

Junior Year

Fall Semester: 17 Credits

- CS-UY 3224 Operating Systems *4 Credits*

- CS Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits* [5]
- Science Elective *3 Credits* [4]
- Free Elective *3 Credits*

Spring Semester: 16 Credits

- CS Elective *3 Credits*
- CS Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits* [5]
- Free Elective *3 Credits*
- Free Elective *3 Credits*

Senior Year

Fall Semester: 16 Credits

- CS-UY 4513 Software Engineering *3 Credits*
- CS Elective *3 Credits*
- CS Elective *3 Credits*
- Free Elective *3 Credits*
- Free Elective *4 Credits*

Spring Semester: 16 Credits

- CS-UY 4523 Design Project *3 Credits*
- CS Elective *3 Credits*
- Free Elective *4 Credits*
- Free Elective *3 Credits*
- Free Elective *3 Credits*

Total credits required for graduation: 128

Footnotes

[1] Grade of C- or better is required in CS-UY 1114, CS-UY 1134, and CS-UY 2124. Students who take CS-UY 1113 and CS-UY 1123 may count four credits toward the CS requirements of the major, in lieu of CS-UY 1114. The other two credits will be counted as free electives.

[2] Students who are placed by examination or by an adviser into MA-UY 914 must defer registration for MA 1024.

[3] The Science electives may be chosen from any of the following natural sciences (Physics, Biology, and Chemistry). Many science courses are 4 credits or require co-requisite lab.

[4] With approval of the CSE department, certain closely related courses in EE, Math or other related disciplines may be substituted for CS electives. A list of approved substitutions is available in the CSE department.

[5] At least one Humanities and Social Sciences elective must be a Writing-intensive course. Writing-intensive Humanities and Social Sciences courses are designated by "W." In addition, one Humanities and Social Sciences elective must be a 3XXX or 4XXX level. Approved Humanities and Social Sciences electives span three clusters: CAM, STS and SEG. Students are encouraged to take Humanities and Social Sciences electives across clusters and/or disciplines within a cluster.

Master of Science

Computer Science, M.S.

Master's Degree Requirements

To satisfy the requirements for the master's degree, the student must complete 30 credits, as described below, with an overall average of B. In addition, a B average is required across the required algorithms course and the four core courses, and a grade of B or better is required for the capstone course, as indicated below. The master's curriculum has four components: 3 credits of algorithms, 12 credits of core elective courses (one of which may also count as the capstone course), one 3 credit capstone course, and 12 credits of general elective courses.

Required Course in Algorithms

Students are required to take CS-GY 6033 Design and Analysis of Algorithms I or CS-GY 6043 Design and Analysis of Algorithms II. Most students will take the Algorithms I course to satisfy the algorithms course requirement. Advanced students who have taken an equivalent Algorithms I course before with a grade of B or better will have the option of taking the Algorithms II course to satisfy the requirement.

Core Course Requirements

Students must take at least four courses from the list of core courses below. The list will be periodically updated by the CSE Department and certain courses may be substituted with departmental consent.

- CS-GY 6063 Software Engineering *3 Credits*
- CS-GY 6083 Principles of Database Systems *3 Credits*
- CS-GY 6133 Computer Architecture I *3 Credits*
- CS-GY 6233 Introduction to Operating Systems *3 Credits*
- CS-GY 6313 Information Visualization *3 Credits*
- CS-GY 6373 Programming Languages *3 Credits*
- CS-GY 6533 Interactive Computer Graphics *3 Credits*
- CS-GY 6613 Artificial Intelligence I *3 Credits*
- CS-GY 6643 Computer Vision *3 Credits*
- CS-GY 6813 Information, Security and Privacy *3 Credits*
- CS-GY 6843 Computer Networking *3 Credits*
- CS-GY 6923 Machine Learning *3 Credits*
- CS-GY 9223 Selected Topics in Computer Science *3 Credits*

Capstone Course Requirement

Certain courses in our department will be designated as capstone courses. Capstone courses are drawn from key technical areas in the MS program and they involve a substantial amount of programming effort. Students are required to take at least one capstone course with a grade of B or better. The list of capstone courses will be posted by the department and will be updated from time to time. If a course is listed both as a capstone course and as a core course, the course can be used to satisfy both the capstone and core course requirements. An MS thesis can also be used to satisfy the capstone course requirement.

Capstone Courses

Here is the approved list of capstone courses:

- CS-GY 6053 Foundation of Data Science *3 Credits*
- CS-GY 6063 Software Engineering *3 Credits*
- CS-GY 6073 Software Engineering II *3 Credits*
- CS-GY 6243 Operating Systems II *3 Credits*
- CS-GY 6253 Distributed Operating Systems *3 Credits*
- CS-GY 6413 Compiler Design and Construction *3 Credits*
- CS-GY 6513 Big Data *3 Credits*
- CS-GY 6533 Interactive Computer Graphics *3 Credits*
- CS-GY 6573 Penetration Testing and Vulnerability Analysis *3 Credits*
- CS-GY 6613 Artificial Intelligence I *3 Credits*
- CS-GY 6643 Computer Vision *3 Credits*
- CS-GY 6673 Neural Network Computing *3 Credits*
- CS-GY 6823 Network Security *3 Credits*
- CS-GY 6943 Artificial Intelligence for Games *3 Credits*
- CS-GY 9163 Application Security *3 Credits*

General Elective Requirements

In addition to the core electives, students are required to take four general elective courses with considerable flexibility; the only restriction is that no more than two of the courses may be taken from outside the Department of Computer Science and Engineering. In particular:

- Master's thesis (6 credits) and/or independent study courses may be part of a student's elective courses. Note that the master's thesis (CS-GY 997X) has an important requirement, as described here.
- Any of the courses in the 13 core areas may be chosen as electives.
- Graduate-level courses from outside of the department (at most two) may be chosen as electives.
- Any CS graduate course not included in the core areas may be chosen as electives.

These courses include (among others):

This list may be updated from time to time based on the current offerings of the department.

- CS-GY 6003 Foundations of Computer Science *3 Credits*
- CS-GY 6033 Design and Analysis of Algorithms I *3 Credits*
- CS-GY 6043 Design and Analysis of Algorithms II *3 Credits*

- CS-GY 6063 Software Engineering *3 Credits*
- CS-GY 6073 Software Engineering II *3 Credits*
- CS-GY 6083 Principles of Database Systems *3 Credits*
- CS-GY 6093 Advanced Database Systems *3 Credits*
- CS-GY 6133 Computer Architecture I *3 Credits*
- CS-GY 6143 Computer Architecture II *3 Credits*
- CS-GY 6233 Introduction to Operating Systems *3 Credits*
- CS-GY 6243 Operating Systems II *3 Credits*
- CS-GY 6253 Distributed Operating Systems *3 Credits*
- CS-GY 6273 Performance Evaluation of Computer Systems *3 Credits*
- CS-GY 6313 Information Visualization *3 Credits*
- CS-GY 6323 Large-Scale Visual Analytics *3 Credits*
- CS-GY 6373 Programming Languages *3 Credits*
- CS-GY 6413 Compiler Design and Construction *3 Credits*
- CS-GY 6533 Interactive Computer Graphics *3 Credits*
- CS-GY 6543 Human Computer Interaction *3 Credits*
- CS-GY 6553 Game Design *3 Credits*
- CS-GY 6613 Artificial Intelligence I *3 Credits*
- CS-GY 6643 Computer Vision *3 Credits*
- CS-GY 6673 Neural Network Computing *3 Credits*
- CS-GY 6703 Computational Geometry *3 Credits*
- CS-GY 6753 Theory of Computation *3 Credits*
- CS-GY 6813 Information, Security and Privacy *3 Credits*
- CS-GY 6823 Network Security *3 Credits*
- CS-GY 6843 Computer Networking *3 Credits*
- CS-GY 6903 Applied Cryptography *3 Credits*
- CS-GY 6913 Web Search Engines *3 Credits*
- CS-GY 6923 Machine Learning *3 Credits*
- CS-GY 6963 Digital Forensics *3 Credits*
- CS-GY 9033 Web Services and SOA *3 Credits*
- CS-GY 9053 Introduction to Java *3 Credits*
- CS-GY 9093 Biometrics *3 Credits*
- CS-GY 9103 Object Oriented Design with Java *3 Credits*
- CS-GY 9133 Emerging Technology for IP *3 Credits*
- CS-GY 9163 Application Security *3 Credits*
- CS-GY 9223 Selected Topics in Computer Science *3 Credits*

Preparatory Course

The Bridge to NYU Tandon Program is a prerequisite course recommended to those interested in applying for the C omputer Science Master's Degree who are lacking a background in computer science, mathematics, science, or engineering.

If you have a degree in liberal arts or similar, our one-course online program will provide you the tools needed to upgrade your computer science knowledge for consideration to a qualifying master's degree at the School of Engineering. Should you complete this intensive bridge course with a grade of B+ or better, you are eligible to be admitted without any course deficiencies, should you meet all other School of Engineering admission requirements.

Learn more: Computer Science Bridge Program

Doctor of Philosophy

Computer Science, Ph.D.

Requirements for PhD in Computer Science

Summary

To receive a PhD in Computer Science at the NYU Tandon School of Engineering, a student must:

- satisfy a breadth course requirement, intended to ensure broad knowledge of computer science,
- satisfy a depth requirement, consisting of an oral qualifying exam presentation with a written report, to ensure the student's ability to do research,
- submit a written thesis proposal and make an oral presentation about the proposal,
- write a PhD thesis that must be approved by a dissertation guidance committee and present an oral thesis defense, and
- satisfy all requirements for the PhD degree, as described in the NYU Tandon School of Engineering bulletin, including graduate study duration, credit points, GPA, and time-to-degree requirements.

Upon entering the program, each student will be assigned an advisor who will guide them in formulating an individual study plan directing their course choice for the first two years. The department will hold an annual PhD Student Assessment Meeting, in which all PhD students will be formally reviewed.

1. Credits Requirements and Transfer Credits

In order to obtain a PhD degree, a student must complete a minimum of 75 credits of graduate work beyond the BS degree, including at least 21 credits of dissertation. A Master of Science in Computer Science may be transferred as 30 credits without taking individual courses into consideration. Other graduate coursework in Computer Science may be transferred on a course-by-course basis. Graduate coursework in areas other than Computer Science can be transferred on a course-by-course basis with approval of the PhD Committee (PHDC). The NYU Tandon School of Engineering places some limits on the number and types of transfer credits that are available. Applications for transfer credits must be submitted for consideration before the end of the first semester of matriculation. Further details can be found in the NYU Tandon School of Engineering bulletin.

2. Individual Study Plan

Each incoming PhD student will be assigned to a research advisor, or to an interim advisor, who will provide academic advising until the student has a research advisor. The advisor will meet with the student when the student enters the program to guide the student in formulating an Individual Study Plan. The purpose of the plan is to guide the student's course choice for the first two years in the program and to ensure that the student meets the breadth requirements. The plan may also specify additional courses to be taken by the student in order to acquire necessary background and expertise. Subsequent changes to the plan must be approved by the advisor.

3. Breadth Requirement

Each PhD student must complete a breadth requirement consisting of 6 courses. To remain in good academic standing, students must fulfill the breadth requirement within 24 months of entering the PhD program.

Students who do not fulfill the breadth requirement within 24 months will be dismissed from the program, unless an exception is granted by the PHDC. The PHDC will consult with the student's research advisor to decide whether an exception is granted and to determine the conditions the student needs to meet.

Details of Breadth Requirement

The courses used to fulfill the breadth requirement must satisfy the following:

(a) Approved list courses: At least 4 of the courses must be taken from the approved list of courses given in the appendix. The 4 courses must satisfy the following two requirements:

i) Theory requirement: At least one of the 4 courses must be taken in the Theory area.

ii) Systems & Applications Requirement: At least two of the 4 courses must be taken in Systems & Applications.

Exemptions from approved list courses: Students who have previously received a grade of A or A- in a graduate course similar to one on the approved list, while enrolled in a graduate program at a university with standards comparable to those at NYU, can use that course in lieu of taking the course on the approved list. The determination of whether a previously taken course can be used in this way will be made by the PHDC. However, any student who uses courses taken in another university to fulfill one or both of the Systems & Applications course requirements must work on a medium-size or larger software project at NYU. This project can be part of coursework or the student's research. A brief report on the project must be produced and approved by the PHDC.

Approved Course List: The list of approved courses will be reviewed regularly by the PHDC and is subject to change. Any changes must be approved by the CSE Department. In order for a course to be considered for inclusion in the list, the course must be rigorous and the students in it must be evaluated individually. Examples of inappropriate courses include those in which students are traditionally not differentially evaluated (e.g., all students receive A's or "pass") and courses in which grades are based on attendance or making a presentation of someone else's work, rather than on tests and assignments.

Students, under their advisors' guidance, should select their courses from the approved list so that they are exposed to a broad set of topics in computer science.

(b) Free choice courses: Students must take 2 free choice courses in addition to the 4 required courses from the approved list. Students can use any graduate course at NYU as free choice courses, but must obtain advisor approval to use a course not on the approved list. Students cannot use independent study courses (such as Advanced Project CS-GY 9963 or Readings in Computer Science, CS-GY 9413 and CS-GY 9423) or dissertation. No exemptions are available for free choice courses.

(c) GPA requirement: Students must receive a grade of at least B in each of the six courses used to fulfill the breadth requirement. The average in the 4 approved list courses used to fulfill the breadth requirement must be at least 3.5. (For students who receive exemptions allowing them to take fewer than 4 approved list courses, the average will be calculated over those courses.) The average in the 2 free choice courses must also be at least 3.5.

(d) Requirement for Students who have never taken an Algorithms Course: Any student who has not taken a course in Algorithms prior to entering the PhD program, at either the undergraduate or the graduate level, must take a graduate course in algorithms while in the PhD program. Students may take CS-GY 6033 (Design and Analysis of Algorithms I), CS-GY 6043 (Design and Analysis of Algorithms II), or CSCI-GA.3520 (Honors Analysis of Algorithms) to fulfill this requirement. The department may revise this list in the future depending on course offerings. Alternatively, students may petition the PHDC to use another course. The grade received in the course must be at least B.

4. Depth Requirement

By the end of a student's third semester in the program, at the latest, the student must be involved in a research project under the guidance of a faculty research advisor. It is the responsibility of each student to find a faculty advisor and a research project, and to inform the PHDC Chair about his/her choice of advisor. Students must inform the PHDC chair if they change their research advisor.

To satisfy the depth requirement, students must take a qualifying exam (QE) based on their research. The QE must be taken before the start of the student's fifth semester in the program. Students are required to form a QE committee, select an exam topic, and a tentative date approved by the advisor and committee, by the end of their third semester.

The QE committee must consist of the advisor and at least two other members. The committee must be approved by the advisor and the PHDC. The advisor is the designated chair of the committee. All members of the QE committee must be CSE faculty, faculty from other departments at NYU, or individuals of like standing from outside the university. At least two of the QE committee members must be tenured or tenure-track members of the CSE department, unless permission is obtained from the PHDC to include only one such member.

For the QE, the student must give an oral presentation of her/his research accomplishments to the QE committee and write a detailed document describing those accomplishments. The document must be submitted to the QE committee and the PHDC no later than one week before the oral presentation. A student is expected to have conducted original research by the time of the exam. This research may have been carried out independently or in collaboration with faculty, research staff, or other students. Students are encouraged, but not required, to have publication-worthy results by the time of the exam. It is not sufficient for a student to present a survey of previous work in an area or a reimplementation of algorithms, techniques, or systems developed by others.

The committee, by majority vote, gives a grade for the exam as one of "PhD Pass", "MS Pass", or "Fail." The chair of the QE committee will send this grade in writing to the student and to the PHDC chair, together with a written evaluation of the student's performance, approved by the QE committee members. A student who does not receive a "PhD pass" may request permission from the PHDC to retake the exam. The PHDC will consult with the QE committee, review the case and make the final decision as to whether a retake is allowed or not. A student may petition the PHDC to change one or more members of the QE committee, but approval of the request will be at the PHDC's discretion.

If the request for a retake is approved, the QE committee will determine the date for the second attempt. If the student is not allowed to retake the exam, the student will not be allowed to continue in the PhD program in the following semester. If the student does not pass the qualifying exam on the second attempt, or otherwise does not satisfy the conditions given to her/him upon failing the exam the first time, the student will not be allowed to continue in the PhD program in the following semester.

If a student has passed the QE and then changes his/her area of research, the student need not retake the QE.

Part-time students can petition the PHDC for extensions to the deadlines associated with the qualifying exam. Extensions should be for at most 2 semesters, except in extraordinary cases. Approval of extensions is at the discretion of the PHDC.

5. Thesis Proposal and Presentation

Within 6 months of passing the QE, each student is required to form a dissertation guidance committee. This committee must be approved by the student's research advisor and by the PHDC. The committee must include at least four members. The committee members can be CSE faculty, faculty from other departments at NYU, or individuals of like standing from outside the university. At least one member of the dissertation guidance committee must be a tenured or tenure-track CSE faculty member, and at least one member of the committee must be from outside the CSE department.

By the end of the student's fifth semester in the program, the student and committee must set a tentative date for the thesis proposal presentation. The presentation must be done prior to the start of the student's seventh semester in the program.

Before finalizing the date of the presentation, the student must submit a written thesis proposal to the dissertation guidance committee which should include:

- a description of the research topic
- an explanation of how the research will advance the state of the art, and
- a tentative research plan

After the dissertation guidance committee has approved the thesis proposal, the student should schedule the thesis proposal presentation and notify the PHDC chair once this has been finalized. The presentation should be announced to the faculty by the PHDC chair at least one week before it occurs. The presentation is open to all faculty. It may also be open to others at the discretion of the research advisor.

Substantial subsequent changes to the thesis topic must be approved by the dissertation guidance committee.

6. Thesis and Thesis Defense

The last, and most substantial, aspect of the PhD program is the dissertation. The research for the dissertation should be conducted in close consultation with the research advisor. When the adviser determines that the student is ready to defend the thesis, a dissertation defense will be scheduled. For the defense, the student will give an oral presentation describing the thesis research, which is open to the public. Following the oral presentation and an initial question and answer session, the dissertation committee and CSE faculty may ask the student further questions in closed session.

Other requirements for the PhD dissertation and defense can be obtained from the Office of the Associate Dean for Graduate Academics in the NYU Tandon School of Engineering.

7. Annual PhD Student Assessment Meeting

All Ph.D. students will be formally reviewed each year in a PhD Student Assessment Meeting. The review is conducted by the entire CSE faculty and includes at least the following items (in no particular order):

- All courses taken, grades received, and GPAs.
- Research productivity: publications, talks, software, systems, etc.
- Faculty input, especially from advisors and committee members.
- Student's own input.
- Cumulative history of the student's progress.

As a result of the review, each student will be placed in one of the following two categories, by vote of the faculty:

- In Good Standing: The student has performed well in the previous semester and may continue in the Ph.D. program for one more year, assuming satisfactory academic progress is maintained.
- Not in Good Standing: The student has not performed sufficiently well in the previous year. The consequences of not being in good standing will vary, and may include being placed on probation, losing RA/GA/TA funding, or not being allowed to continue in the PhD program.

Following the review, students will receive formal letters which will inform them of their standing. The letters may also make specific recommendations to the student as to what will be expected of them in the following year. A copy of each student's letter will be placed in the student's file.

8. NYU Tandon School of Engineering Requirements

Other requirements can be found in the NYU Tandon School of Engineering Bulletin. Students must meet all applicable requirements, including graduate study duration, credit points, GPA, and time-to-degree requirements.

Appendix

The following courses at NYU Tandon of Engineering can be used to satisfy the breadth requirements:

Theory

- CS-GY 6043 Design and Analysis of Algorithms II *3 Credits*
- CS-GY 6703 Computational Geometry *3 Credits*
- CS-GY 6753 Theory of Computation *3 Credits*

Systems & Applications

- CS-GY 6083 Principles of Database Systems *3 Credits*
- CS-GY 6093 Advanced Database Systems *3 Credits*
- CS-GY 6143 Computer Architecture II *3 Credits*
- CS-GY 6243 Operating Systems II *3 Credits*
- CS-GY 6253 Distributed Operating Systems *3 Credits*
- CS-GY 6313 Information Visualization *3 Credits*
- CS-GY 6413 Compiler Design and Construction *3 Credits*
- CS-GY 6513 Big Data *3 Credits*
- CS-GY 6533 Interactive Computer Graphics *3 Credits*
- CS-GY 6543 Human Computer Interaction *3 Credits*
- CS-GY 6553 Game Design *3 Credits*
- CS-GY 6613 Artificial Intelligence I *3 Credits*
- CS-GY 6823 Network Security *3 Credits*
- CS-GY 6843 Computer Networking *3 Credits*
- CS-GY 6913 Web Search Engines *3 Credits*
- CS-GY 6923 Machine Learning *3 Credits*
- CS-GY 6943 Artificial Intelligence for Games *3 Credits*
- CS-GY 9163 Application Security *3 Credits*
- CS-GY 9223 Selected Topics in Computer Science *3 Credits*
  Only the following topics are included:
- Social and Emotional Approaches to HCI

Note

The following courses, offered by the Computer Science Department at the Courant Institute of Mathematical Sciences at NYU, can also be used to satisfy the breadth requirements:

Theory

- CSCI-GA 3520 Honors Analysis of Algorithms

Systems & Applications

- CSCI-GA.2243 High Performance Computer Architecture
- CSCI-GA.2620 Networks and Distributed Systems
- CSCI-GA.3110 Honors Programming Languages
- CSCI-GA.3130 Honors Compilers
- CSCI-GA.3250 Honors Operating Systems
- CSCI-GA.2270 Computer Graphics
- CSCI-GA.2271 Computer Vision
- CSCI-GA.2434 Advanced Database Systems
- CSCI-GA.2560 Artificial Intelligence
- CSCI-GA.2565 Machine Learning
- CSCI-GA.2566 Foundations of Machine Learning
- CSCI-GA.2590 Natural Language Processing

Note

Students who began the program before Fall 2015 have the option of completing the requirements that were in effect at the time they began the program.

Students who began the program before Fall 2017 may count CS-GY 6903 Applied Cryptography as a breadth course in the Theory category, and CS-GY 6063 Software Engineering as a breadth course in the Systems and Applications Category.

Cybersecurity

Program Director: Thomas Reddington

The MS in Cybersecurity Program at NYU Tandon provides students with the critical knowledge and skills to become experts in cybersecurity, the science of protecting vital computer networks and electronic infrastructures from attacks. The program responds to the growing demand for security specialists in industry and in government organizations.

The cybersecurity field is expected to generate many new jobs over the next decade as companies across all industries continue to place top priority on safeguarding their data and information systems. Graduates are well prepared for careers as developers of security products and as security-application programmers, security analysts, penetration testers, vulnerability analysts and security architects. They also may pursue positions as security researchers or continue their studies at the PhD level.

Special Provisions

Transfer Courses

Students with a prior MS or an advanced degree from another institution may be allowed to transfer a maximum of two courses. The Cybersecurity MS Program Committee determines the course equivalence of the transferred course work. For each course to be transferred, the student must provide a complete description, along with lecture and assignment materials. Courses are considered for transfer credit if they were completed less than three years ago.

Student Transfers from other Master's Programs at NYU Tandon School of Engineering
Qualified MS students registered in other NYU Tandon master's programs (e.g., the CS master's program), who can demonstrate adequate skills in cybersecurity, may be permitted to transfer to the MS in Cybersecurity Program. The admission criteria and program requirements are detailed in previous sections.

MS Cybersecurity Transfers to the PhD Program in Computer Science
Qualified Cybersecurity MS students may transfer into the PhD program in Computer Science. The MS Program Committee first must recommend the applicant to the PhD Admissions Committee.

NOTE: Any other programmatic issues are evaluated individually by the Cybersecurity MS Program Committee.

Requirements for Master of Science in Cybersecurity

Entrance Requirements

Students need a superior undergraduate record from an accredited institution. Preferably, students should have an undergraduate degree in computer science, mathematics, science or engineering. However, applicants with degrees in other fields are considered individually for admission. Additionally, students must satisfy the following:

1. Knowledge of mathematics through calculus.
2. At least one year of university-level science.
3. A working knowledge of a high-level, general-purpose programming language (preferably C++) and of data structures.

Students who do not satisfy requirement 3 may satisfy the requirements by taking one or two non-credit, preparatory bridge courses.

Students who have superior academic credentials but who lack insufficient background are admitted with conditional status, pending satisfactory completion of preparatory bridge courses. In some cases, such students are interviewed to determine the necessary preparatory courses they need. Successful completion of the preparatory courses with a B or better average grade is a necessary condition for transfer to regular status.

The demonstrated ability to communicate in written and spoken English is essential to success in graduate studies in computer science and information systems engineering and is required for regular status. Foreign students and others for whom English is a second language may be required to undertake preparatory work to improve their language skills before admission into the graduate program.

Admission with advanced standing is accepted in accordance with NYU Tandon regulations published in the catalog. A maximum of 9 credits may be applied to the MS degree from previous graduate work at an acceptable institution.

Statement of Purpose

Applicants also should submit a special purpose statement clearly stating their experience in cybersecurity, and their motivation for applying to the program.

Non-Degree

Cybersecurity Minor

Overview:

Interested in understanding how systems can be hacked? Interested in understanding how systems can be designed to prevent them from being hacked? Want to understand how the latest reflection attack exploits have taken down entire systems? Want to learn the right areas of Computer Security to help you have relevant and useful skills for entering a growing field of industry? This minor may be of interest to you.

The CSE Department has been designated as a Center for Excellence in Cybersecurity Education and Research by the NSA and has an active cadre of students specializing in Cybersecurity, some of whom are supported by the NSF through it's Scholarships for Service program. The minor program focuses on the technical aspects of security systems and is geared for those who are enrolled in a technical program in Computer Science or a related field. It covers, at a detailed level, technology that is used to detect security violations, technology that is used to build security appliances, and technology that is used to secure applications.

The program is unique within the NYU academic community and will be of interest to many students majoring in the NYU Tandon School of Engineering's BS programs in Computer Science and Computer Engineering. It may also be appealing to some students in the CAS BA program in Computer Science or related programs.

Students taking the minor must complete several prerequisite NYU Tandon School of Engineering Math and Computer Science courses (or similar courses offered by Courant). The minor requirements then comprise five security related courses. Students may count CS / EE courses in the minor as CS / EE electives in the BS degree programs in Computer Science and Computer Engineering.

Cybersecurity is focused on the technical aspects of security systems and geared for those who are enrolled in a technical program in Computer Science or related field. It covers at a detailed level technology that is used to detect security violations, technology that is used to build security appliances and technology that is used to secure applications. This minor is geared towards students who want to work in a technical field of security such as penetration testing or developing secure applications or who plan to go onto graduate education in security. Inquiries should be directed to the coordinator of academic advising, Susana Garcia-Henriquez.

Cybersecurity Minor (15 credits):

Prerequisites:

Students will be expected to complete a minimal core curriculum (knowledge of programming, data structures, discrete math, and some computer architecture) in the CS undergraduate program, before enrolling in this minor, in order to be well prepared for the security coursework. Students who would like to pursue this minor who are not also CS majors will have to complete these courses (or show equivalent mastery) in addition to the minor requirements.The typical pathway through the pre-requisite chain for NYU Tandon School of Engineering students will include the following five courses:

CS-UY 1114 Introduction to Programming and Problem Solving
CS-UY 1134 Data Structures and Algorithms*
CS-UY 2124 Object Oriented Programming*

***Note:** *Students who entered NYU Tandon prior to FA16 may take* CS-UY 1124 Object Oriented Programming and CS-UY 2134 Data Structures and Algorithms *instead of CS-UY 1134 and CS-UY 2124.*

MA-UY 2314 Discrete Mathematics
CS-UY 2214 Computer Architecture and Organization

NYU Tandon School of Engineering Computer Science or Computer Engineering majors can take CS-UY 3224 Operating Systems as a co-requisite with CS-UY 3923 Computer Security.

Alternatively, students may satisfy most of the pre-requisites with courses in the College of Arts and Sciences:

CSCI-UA.0002 or placement exam
CSCI-UA.0101 (Introduction to Computer Science)
CSCI-UA.0102 (Data Structures)
CSCI-UA.0201 Computer Systems Organization)
MATH-UA.0120 (Discrete Mathematics).

These prerequisites can be completed by the fourth or fifth semester, leaving 3-4 semesters to complete the minor. Some courses require other security courses as prerequisites. Students should be sure to fulfill all necessary course requirements.

Cybersecurity Minor Courses:

This minor consists of 15 credit units: four required 3-credit courses and one 3-credit elective.

Cybersecurity Minor Required Core (12 credits):

- CS-UY 3923 Computer Security *3 Credits*
- CS-UY 3933 Network Security *3 Credits*
- CS-UY 4753 Application Security *3 Credits*
- CS-UY 4793 Computer Networking *3 Credits* **OR** ECE-UY 3613 Communication Networks

Cybersecurity Minor Electives (3 Credits):

In addition to these four core courses, students must take 3 additional credits from the following security courses from the NYU Tandon School of Engineering CS curriculum and from university-wide electives. Course options include:

NYU Tandon SOE Security Courses

- CS-UY 4763 Information Systems Security Engineering and Management *3 Credits*
- CS-UY 4773 Penetration Testing and Vulnerability Analysis *3 Credits*
- CS-UY 4783 Applied Cryptography *3 Credits*
- EL-GY 9423 Computer Electronic Devices and System: Intro to Hardware Security & Trust *3 Credits*

University-wide Electives:

Students may take a security related elective from outside the NYU Tandon School of Engineering with permission of the program director. Students who are doing a security related senior design project may use this as one elective in the Cybersecurity minor.

Suggested Sequence of Courses:

Computer Security (CS-UY 3923) can be taken at the same time as *Operating Systems* (5th semester of study for students entering CS BS program without advanced placement). Computer Security is a prerequisite for *Application Security (CS-UY 4753)*. *Computer Networking (CS-UY 4793)* can be taken as early as the 4th semester, once the student has completed *Data Structures & Algorithms (CS-UY 2134)* and *Object-Oriented Programming (CS-UY 2124)*. *Computer Networking* is a prerequisite for *Network Security (CS-UY 3933)*, which, in turn, is a prerequisite for certain, more advanced electives. Students are advised to take these core courses during the junior year and/or first semester of the senior year, and then to take remaining security electives during the senior year.

CAS students who plan to take the cybersecurity minor should be aware that the minor will require them to take at least four courses (12 credits) at the NYU Tandon School of Engineering and that there is a limit (four courses or 16 credits) on the number of courses they may take outside of CAS. Thus, they must plan their programs carefully.

Master of Science

Cybersecurity Risk and Strategy, M.S. (Offered jointly by the NYU School of Law and NYU Tandon School of Engineering)

Link: https://cybersecurity-strategy-masters.nyu.edu/mscrs-program-overview/

Program Overview

Overview

Offered jointly by NYU School of Law and NYU Tandon School of Engineering, the MS in Cybersecurity Risk and Strategy is a one-year program intended for experienced professionals from a range of backgrounds who seek to deepen their understanding of cybersecurity risk and strategy. Cybersecurity-both prevention and response-frequently requires coordination between public- and private-sector organizations and expertise in technology, law, and policy. This program will create managers with the integrated expertise needed to play a leadership role in the field.

Program Format

The MS in Cybersecurity Risk and Strategy program is a 30-credit MS management degree for professionals, incorporating both online courses and blended-learning modules. Over a 12-month period, participants will participate in three one week residential sessions,*
along with two days for Capstone Presentations and Graduation in May 2022. Between residential periods, students will study 10-15 hours per week in online and blended-learning formats. Semesters are divided into three phases: online introduction, in-class residency,* and
online implementation. Spanning all three semesters is the "Integrative Cybersecurity Management" capstone, a team-based project.

Program Length

1 Year

Program Start

May 2021

Residency Format

The three in-person sessions* will take place over the course of one week of on-campus instruction and will be held in the Summer Semester, Fall Semester, and Spring Semester.

In addition to the online pre-program courses, students will be responsible for completing readings and online seminars between each in-person session.*

Residency Dates

Dates for Class of 2022:

1. June 14-19, 2021
2. October 18-23, 2021
3. March 14-19, 2022
4. Capstone presentations and Graduation: May 2022 (Capstone presentation date TBD)

Language

All classes are instructed in English.

Fee

The program fee for the Class of 2022 is US $85,500. This fee includes tuition, course materials, and official events. Hotel and travel expenses are not included.*

A **non-refundable tuition pre-payment of $600 USD** is required to secure a spot in the Class of 2022 and begin the pre-program coursework.

The **program fee** will be paid in installments of:

1. **$27,900** for the Summer 2021 semester
2. **$28,500** for the Fall 2021 semester
3. **$28,500** for the Spring 2022 semester

Capstone Project

Spanning all three semesters is the "Integrative Cybersecurity Management" capstone, a team-based project that will allow students to demonstrate their ability to take an integrated view of cybersecurity risk and strategy. Working in groups, students will tackle difficult challenges of technology, law, risk, and strategy.

As students refine their projects, teams will meet and discuss issues related to the capstone with the Faculty Directors (and other faculty members or industry mentors, as appropriate). By the end of the degree program students will be required to present final projects designed to solve specific operational cybersecurity challenges from an interdisciplinary perspective.

Learn More: Cybersecurity Risk and Strategy (https://cybersecurity-strategy-masters.nyu.edu/mscrs-program-overview)

*Due to COVID-19 and resulting travel restrictions, future in-person residencies may be converted to remote instruction. We will share more information as it becomes available.

Cybersecurity, M.S.

Master's Degree Requirements

Core Electives and Requirements

To satisfy the requirements for the Cybersecurity MS program, the student must complete 30 credits, as listed below, with an overall average of B. In addition, a B average is required across all the required core courses, as indicated below.

Computer Science Core Courses

- CS-GY 6233 Introduction to Operating Systems *3 Credits*
- CS-GY 6843 Computer Networking *3 Credits*
- CS-GY 6033 Design and Analysis of Algorithms I *3 Credits*

Security Core Courses

Most of the required Security Core courses have a project component.

- CS-GY 6813 Information, Security and Privacy *3 Credits*
- CS-GY 6823 Network Security *3 Credits*
- CS-GY 6903 Applied Cryptography *3 Credits*
- CS-GY 9163 Application Security *3 Credits*

Electives (3 courses)

Students may choose security-related courses from the NYU Tandon School of Engineering or from other schools of New York University, including courses in the psychology, law and sociology departments. Selected courses must be approved by the Program Committee. All of the following courses are preapproved; others must be approved by the Program Committee.

- CS-GY 6573 Penetration Testing and Vulnerability Analysis *3 Credits*
- CS-GY 6803 Information Systems Security Engineering and Management *3 Credits*
- CS-GY 9093 Biometrics *3 Credits*
- CS-GY 6963 Digital Forensics *3 Credits*
- CS-GY 9963 Advanced Project in Computer Science *3 Credits*
- CS-GY 6043 Design and Analysis of Algorithms II *3 Credits*
- CS-GY 6133 Computer Architecture I *3 Credits*
- CS-GY 6003 Foundations of Computer Science *3 Credits*

Footnotes

* Any required Computer Science core courses may be replaced if the student has taken a similar class.

Research Project (Optional)

One goal of the MS in Cybersecurity is to introduce students to exciting research in cybersecurity and to attract some of them to pursue a PhD degree. To this end, NYU Tandon Online offers a semester-long Advanced Project in Computer Science (CS-GY 9963) in cybersecurity (as listed above), as an elective. Students selecting this option are guided by a research professor and gain invaluable research experience.

Preparatory Courses

We offer 3 preparatory bridge courses for students who do not have a working knowledge of a high level, general-purpose programming language or a background in sets, functions, relations, asymptotic notation, proof techniques, induction, combinatorics, discrete probability, recurrences, graphs, trees, mathematical models of computation and undecidability.

- CS-GY 5303 Introduction to Programming and Problem Solving *3 Credits*
- CS-GY 5403 Data Structures and Algorithms *3 Credits*
- CS-GY 6003 Foundations of Computer Science *3 Credits*

Master's Thesis (optional)

In addition to the above semester-long, research experience for students, the program also offers research-oriented MS students the master's thesis option. With this option, a student takes 6 credits of CS-GY 997X MS Thesis in Computer Science working with a faculty adviser on a research problem in cybersecurity, in lieu of two out of the three required electives.

The research need not be original, but should demonstrate adequately the student's proficiency in the subject. An oral defense of the master's thesis before at least three professors is required. The 6 credits of master's thesis must span two consecutive semesters. Whenever relevant, 3 credits of CS-GY 9963 may be used as 3 credits of CS-GY 997X, subject to faculty-adviser approval.

Cyber Ops Specialization

National Centers of Academic Excellence in Cyber Operations Program:

NYU Tandon School of Engineering is one of about 20 graduate schools in the country to have the designation of National Centers of Academic Excellence (CAE) in Cyber Operations. The CAE-Cyber Operations program is intended to be a deeply technical, interdisciplinary, higher education program firmly grounded in the computer science (CS), computer engineering (CE), and/or electrical engineering (EE) disciplines, with extensive opportunities for hands-on applications via labs/exercises.

National Centers of Academic Excellence - Cyber Operations

Courses:

Students who wish to receive an acknowledgment that they have completed the NSA Cyber Operation Program must successfully complete the following courses:

3 Credits **Design and Analysis of Algorithms I** CS-GY6033

3 Credits **Introduction to Operating Systems** CS-GY6233

3 Credits **Penetration Testing and Vulnerability Analysis**CS-GY6573

3 Credits **Information Systems Security Engineering and Management** CS-GY6803

3 Credits **Information, Security and Privacy** CS-GY6813

3 Credits **Network Security** CS-GY6823

3 Credits **Computer Networking** CS-GY6843

3 Credits **Applied Cryptography** CS-GY6903

3 Credits **Application Security** CS-GY9163

The CAE in Cyber Operations Summer Program (CAE-Cyber Ops SP) is the National Security Agency's (NSA) premier outreach program for students enrolled in the Cyber Operations specialization at NSA-designated universities. Selectees will be invited to participate in a 12-week summer program to gain knowledge of specific cyber-related topics and apply educational knowledge to address various real-world mission-related technical challenges. Participants in the program will work on a broad range of problems involving applications of computer science and engineering.

CAE in Cyber Operations Summer Intern Program

Preparatory Course

Bridge to NYU Tandon:

The Bridge to NYU Tandon Program is a prerequisite course recommended to those interested in applying for the Cybersecurity Master's Degree who are lacking a background in science or engineering.

If you have a degree in liberal arts or similar, our one-course online program will provide you the tools needed to upgrade your math, science or engineering knowledge for consideration to a qualifying master's degree at the School of Engineering. Should you complete this intensive bridge course with a grade of B+ or better, you are eligible to be admitted without any course deficiencies, should you meet all other School of Engineering admission requirements.

Learn More: Cybersecurity Bridge Program

Department of Electrical and Computer Engineering

Chair: Ivan Selesnick

Mission Statement

The department's mission is to engage students who seek educational achievement as the nation enters a new age with new demands and opportunities. The goal is to provide students with a broad based education for electrical- and computer-engineering careers. NYU Tandon School of Engineering students gain the skills to become creative leaders in their professional careers with the passion and desire to discover, invent, innovate, apply and advance new science and technology to solve the world's most critical problems.

The Department

Electrical and computer engineers-whose technical skills have produced innovations in telephones, electric power systems, rapid transit, radio, television, medical electronics, computers, microelectronics, the Internet and wireless communications-have contributed more to the quality of 20th-century life than any other profession. Twenty-first century engineering innovation will be equally exciting.

The Department of Electrical and Computer Engineering is well respected worldwide for its major contributions to the profession and its tradition of teaching and research excellence. NYU Tandon electrical and computer engineering graduates are prominent in university faculties, industrial labs and company boardrooms, spanning the range of the electrical, electronic and information-technology industries.

The department enters the 21st century with strong teaching and research programs in the most exciting digital-age fields: the Internet, wireless communications, computers, multimedia signal processing, robotics, automatic control and electric-power generation and distribution.

In the intimate NYU Tandon environment, students benefit from frequent access to faculty members and laboratories at the forefront of innovation. In the spirit of entrepreneurship, NYU Tandon's infrastructure encourages faculty and students to transfer their inventions to industry and to start their own companies.

The department hosts the Center for Advanced Technology in Telecommunications (CATT), a New York State-sponsored research center, and NYU Wireless, the world's first academic research center combining Wireless, Computing, and Medical applications. Together, these centers greatly strengthen the department in telecommunication networks and in wireless-communications research and education.

Contact

NYU Tandon School of Engineering
Five MetroTech Center
Brooklyn, NY 11201
Tel: (646) 997-3590
Fax: (646) 997-3906
Web: https://engineering.nyu.edu/ece/

The Profession

The rapidly growing profession of electrical engineering has evolved from its early beginnings in electric- power generation and distribution through the development of radio, television, control and materials to computers, telecommunications and health care. In the last century, electrical engineers have created advances in power distribution, computers and communications that have changed the world. Their inventions have made the world a smaller, safer place and allow for immediate reporting and images from distant places that make world events part of daily life.

While electrical engineering undergraduate and graduate students concentrate on areas of electrical science, graduates apply their training to diversified fields such as electronic design, bioengineering, city planning, astronautics, radio astronomy, system engineering, image processing, telemetry, the Internet, computer design, management and patent law. As students mature and realize their abilities, they may choose professional lives in engineering, government, or education.

The expertise of NYU Tandon's electrical engineering faculty covers a wide range of fields. Principal areas of teaching and research are microelectronic devices and systems; computer engineering; telecommunication networks; signal, image, and video processing; microwave engineering; wireless communications; power systems and energy conversion; plasma science and engineering; systems and control engineering; robotics; and nano-electronics.

Degrees Offered

The Department of Electrical and Computer Engineering offers the following degree and certificate programs. Separate sections of this catalog present the objectives, requirements, advising resources and courses for individual programs.

Bachelor of Science

- Computer Engineering, B.S. offered by the Computer Engineering Program
- Electrical Engineering, B.S. offered by the Electrical Engineering Program
- Electrical Engineering and Computer Engineering (dual major), B.S.

Master of Science

- Computer Engineering, M.S. offered by the Computer Engineering Program
- Electrical Engineering, M.S. offered by the Electrical Engineering Program

Doctor of Philosophy

- Electrical and Computer Engineering, Ph.D. offered by the Electrical Engineering Program

Special Undergraduate Options

The BS/MS Option: This program is available to exceptional undergraduate students, enabling them to earn both a bachelor's and a master's degree.

Possible BS/MS combinations include BS in Electrical or Computer Engineering with a MS in Electrical Engineering, Computer Engineering or Computer Science.

Electrical Engineering and Computer Engineering (dual major), B.S.**:** A student can earn a Bachelor of Science degree in Electrical and Computer Engineering by completing 141 credits.

Minors: Electrical Engineering Minor, Computer Engineering Minor, or Robotics Interdisciplinary Minor (in collaboration with the Department of Mechanical and Aerospace Engineering)

Student Organizations

NYU Tandon students may join student chapters of these professional organizations: the Institute of Electrical and Electronics Engineers (IEEE) and Eta Kappa Nu, the Electrical Engineering Honor Society.

Speciality Labs

The department keeps pace with dynamic advances in electrical and computer engineering by maintaining state-of-the-art laboratories for instruction and experimentation. Laboratory courses combine lectures, experiments and project work. These courses also provide students with a rich set of elective choices, opportunities to work on senior projects with faculty researchers, valuable hands-on experience to enhance and supplement material taught in lecture classes, and forums to practice their oral and written communication skills.

The Wireless Lab provides formal experiments, lectures and project work on state-of-the-art, commercial spread-spectrum wireless access systems, including bit-error rate analysis and UHF channel propagation measurements.

The Multimedia Lab offers students hands-on experience to acquire, process and transmit voice, audio, image and video signals to create multimedia documents and to configure networked multimedia applications.

The Local Area Networks Lab includes a set of weekly experiments using Linux-based terminals, Ethernet LANs, routers and bridges and associated software with which to conduct a variety of LAN/WAN experiments and projects.

The High-Speed Networking Lab, equipped with various equipment and tools, allows faculty and students to build hardware prototypes (VLSI/FPGA chips and PCB) and software test bed to demonstrate their research concepts in high-performance routers, network security and network on chip.

The VLSI Design Lab treats Very Large-Scale Integrated-circuit design, performance analysis and circuit characterization, using industry-standard VLSI CAD tools and hardware-description languages such as VHDL. Students study the design of CMOS logic, standard cells, gate arrays and mixed-signal (analog/digital) circuits.

The Electric Power Laboratory fosters education and research for undergraduate and graduate studies. Equipment includes modern data-acquisition equipment, smart-power supplies and loads, digital meters, high-performance computing facility for data-driven and computationally-intensive tasks, power transformers and classical rotating machine pairs for dynamic testing and loading. In addition, static converters are available for experiments on Smart Grid and Distributed Resources, such as solar and fuel cells, energy storage, demand-side management, wind power and variable-speed drives.

The Control/Robotics Lab provides a variety of experiments and project work focusing on feedback control, data acquisition and computer control.

The Microwave Lab treats the design, fabrication and testing of passive and active circuits and antennas using modern CAD and measurement software and hardware.

Center for Advanced Technology in Telecommunications

Through the New York State Center for Advanced Technology in Telecommunications (CATT), electrical and computer engineering faculty collaborate with industry in research, education and technology transfer in telecommunications and information systems. CATT is distinguished for its innovations in many fast-moving areas, including broadband networks, peer-to-peer networking, switch design and implementation, security hardware, ad-hoc wireless networks, cellular networks, wireless local area networks, software design and reliability, search engine technology, network design tools, traffic planning and capacity engineering, image and video coding and transport.

NYU Wireless

NYU WIRELESS is a multi-disciplinary academic research center that offers an unprecedented and unique set of skills.

Centered at New York University's Brooklyn engineering location and involving faculty and students throughout the entire NYU community, NYU WIRELESS offers its industrial-affiliate sponsors, faculty members, and students a world-class research environment that is creating the fundamental theories and techniques for next-generation mass-deployable wireless devices across a wide range of applications and markets.

This center combines NYU Tandon's School of Engineering program with NYU's School of Medicine and the Courant Institute of Mathematical Sciences, and offers a depth of expertise with unparalleled capabilities for the creation of new wireless net.

Faculty

Professors

H. Jonathan Chao, Professor of Electrical and Computer Engineering
PhD, The Ohio State University
Network security, high-performance routers, network on chip

Dariusz Czarkowski, Professor of Electrical and Computer Engineering
PhD, University of Florida
Power electronics and systems, electric drives

Elza Erkip, Institute Professor and Professor of Electrical and Computer Engineering
PhD, Stanford University
Wireless communication, communication theory, information theory

Zhong-Ping Jiang, Professor of Electrical and Computer Engineering
PhD, École des Mines de Paris (France)
Control systems, complex networks

Ramesh Karri, Professor of Electrical and Computer Engineering
PhD, University of California, San Diego
VLSI, CAD, computer engineering

Farshad Khorrami, Professor of Electrical and Computer Engineering
PhD, The Ohio State University
Robotics, control systems

Jelena Kovačević, Professor of Electrical and Computer Engineering, Dean of NYU Tandon School of Engineering
PhD, Columbia University
Signal processing, biomedical image analysis

Spencer P. Kuo, Professor of Electrical and Computer Engineering
PhD, Polytechnic Institute of Brooklyn Plasmas and electromagnetics

Yong Liu, Professor of Electrical and Computer Engineering
PhD, University of Massachusetts, Amherst
Communication networks

I-Tai Lu, Professor of Electrical and Computer Engineering
PhD, Polytechnic Institute of Brooklyn
Electromagnetics, acoustics, wireless communication

Shivendra S. Panwar, Professor of Electrical and Computer Engineering, Director of the New York State Center for Advanced Technology in Telecommunications
PhD, University of Massachusetts, Amherst
Communication networks

S. Unnikrishna Pillai, Professor of Electrical and Computer Engineering
PhD, University of Pennsylvania
Signal processing and communications

Sundeep Rangan, Professor of Electrical and Computer Engineering
PhD, University of California, Berkeley
Wireless communication, signal processing and estimation, information theory

Theodore Rappaport, David Lee/Ernst Weber Professor of Electrical Engineering
PhD, Purdue University
Wireless communications

Ivan Selesnick, Professor of Electrical and Computer Engineering
PhD, Rice University
Signal processing

Yao Wang, Professor of Electrical and Computer Engineering
PhD, University of California, Santa Barbara
Image and video processing, computer vision, medical imaging

Zivan Zabar, Professor of Electrical and Computer Engineering
Sc.D., Technion - Israel Institute of Technology
Electric power systems, electric drives, power electronics

Associate Professors

Nirod K. Das, Associate Professor of Electrical and Computer Engineering
PhD, University of Massachusetts
Electromagnetics, antennas, microwave integrated circuits

Francisco de Leon, Associate Professor of Electrical and Computer Engineering
PhD, University of Toronto (Canada)
Power-system analysis, distributed generation systems, smart grid

Ludovic Righetti, Associate Professor of Electrical and Computer Engineering
PhD, Ecole Polytechnique Fédérale de Lausanne (Switzerland)
Robotics

Peter Voltz, Associate Professor of Electrical and Computer Engineering; Associate Dean for Undergraduate and Graduate Academics
PhD, Polytechnic Institute of New York
Communications and signal processing

Assistant Professors

Anna Choromanska, Assistant Professor of Electrical and Computer Engineering
PhD, Columbia University
Machine learning

Yury Dvorkin, Assistant Professor of Electrical and Computer Engineering
PhD, University of Washington
Smart grids

Siddharth Garg, Assistant Professor of Electrical and Computer Engineering
PhD, Carnegie Mellon University
Computer engineering

Giuseppe Loianno, Assistant Professor of Electrical and Computer Engineering
PhD, University of Naples Federico II
Robotics

Shaloo Rakheja, Assistant Professor of Electrical and Computer Engineering
PhD, Georgia Institute of Technology
Nanoscale electronics

Davood Shahrjerdi, Assistant Professor of Electrical and Computer Engineering
PhD, University of Texas at Austin
Electronic materials, device structures and circuits

Quanyan Zhu, Assistant Professor of Electrical and Computer Engineering, Mathematics
PhD, University of Illinois at Urbana-Champaign
Game theory and applications, optimization

Associated and Affiliated Faculty

Steve Arnold, University and Thomas Potts Professor of Physics (Joint appointment with Department of Applied Physics)
PhD, City University of New York
Microparticle photophysics, photonic atom biosensors

Juan Bello, Associate Professor of Music Technology and Computer Science & Engineering at New York University
PhD, Queen Mary University of London (UK)
Machine listening, music informatics

Leslie Greengard, Silver Professor of Mathematics and Computer Science
PhD, Yale University
Scientific computing, fast algorithms

Yann LeCun, Silver Professor of Computer Science, Neural Science, and Electrical and Computer Engineering,
PhD, Université Pierre et Marie Curie (France)
Machine learning, computer vision

Joel S. Schuman, Professor, Ophthalmology; Professor, Neuroscience and Physiology; Professor, Electrical and Computer Engineering
MD, Mount Sinai School of Medicine
*Ophthalmology, optical coherence tomography***Daniel Sodickson,** Professor, Radiology; Professor, Neuroscience and Physiology; Professor, Electrical and Computer Engineering
PhD, Massachusetts Institute of Technology
Biomedical imaging, magnetic resonance imaging

Research Faculty

David Chudnovsky, Distinguished Research Professor of Electrical and Computer Engineering
PhD, Ukrainian Academy of Sciences
VLSI, computer engineering, field theory, number theory

Gregory Chudnovsky, Distinguished Research Professor of Electrical and Computer Engineering
PhD, Ukrainian Academy of Sciences
VLSI, computer engineering, field theory, number theory

Thanasis Korakis, Research Assistant Professor
PhD, University of Thessaly (Greece)
Wireless networks

Pei Liu, Research Assistant Professor
PhD, Polytechnic University
Wireless Communications and Networks

Yang Xu, Research Assistant Professor
PhD, Tsinghua University (China)
High-speed networking

Industry Faculty

Matthew Campisi, Industry Assistant Professor of Electrical and Computer Engineering
MS, Polytechnic University
Signal processing, medical imaging

Michael Knox, Industry Professor of Electrical and Computer Engineering
PhD, Polytechnic University
Wireless communications, RF and microwave components, analog-circuit design

Thomas Marzetta, Distinguished Industry Professor of Electrical and Computer Engineering
PhD, Massachusetts Institute of Technology
Wireless communication

Adjunct Faculty

Zdzislaw Bochynski, Adjunct Lecturer
MS, Warsaw University of Technology

John Carter, Adjunct Lecturer
PhD, New York University

Xiao-Kang Chen, Adjunct Lecturer
PhD, Polytechnic University

Robert DiFazio, Adjunct Lecturer
PhD, Polytechnic University

Fraida Fund, Adjunct Lecturer
PhD, New York University

Nina Krikorian, Adjunct Lecturer
MS, New York University

Prashanth Krishnamurthy, Adjunct Lecturer
PhD, Polytechnic University

Jonathan Mamou, Adjunct Lecturer
Phd, University of Illinois at Urbana-Champaign

Richard Stern, Adjunct Lecturer
MS, Polytechnic University

David Wang, Adjunct Lecturer
PhD, Polytechnic University

Zhengxue Zhao, Adjunct Lecturer
PhD, Polytechnic University

Presidential Fellows

David J. Goodman, NYU School of Engineering Presidential Fellow
PhD, Imperial College, University of London (England)

Dante C. Youla, NYU School of Engineering Presidential Fellow
MS, New York University

Faculty Emeriti

Henry L. Bertoni, Professor Emeritus of Electrical Engineering
PhD, Polytechnic Institute of Brooklyn

Leo Birenbaum, Associate Professor Emeritus of Electrical Engineering and Electrophysics
MS, Polytechnic Institute of Brooklyn

Joseph J. Bongiorno, Jr., Professor Emeritus of Electrical Engineering
DEE, Polytechnic Institute of Brooklyn

Robert Boorstyn, Professor Emeritus of Electrical Engineering
PhD, Polytechnic Institute of Brooklyn

Frank A. Cassara, Professor Emeritus of Electrical and Computer Engineering
PhD, Polytechnic University

David Chang, Professor Emeritus of Electrical and Computer Engineering
PhD, Harvard University

Douglas A. Davids, Associate Professor Emeritus of Electrical Engineering
PhD, Johns Hopkins University

Istvan Palocz, Professor Emeritus of Electrical Engineering and Electrophysics
PhD, Polytechnic Institute of Brooklyn

Philip E. Sarachik, Professor Emeritus of Electrical Engineering
PhD, Columbia University

Harry Schachter, Professor Emeritus of Electrical Engineering
PhD, Polytechnic Institute of Brooklyn

Benjamin Senitzky, Professor Emeritus of Electrophysics
PhD, Polytechnic Institute of Brooklyn

Sidney S. Shamis, Professor Emeritus of Electrical Engineering
MS, Stevens Institute of Technology

Theodore Tamir, University Professor Emeritus
PhD, Polytechnic Institute of Brooklyn

Wen-Chung Wang, Professor Emeritus of Electrical Engineering and Electrophysics
PhD, Northwestern University

Computer Engineering

Program Directors:
Ramesh Karri

The Department of Electrical and Computer Engineering and the Department of Computer Science and Engineering offer a Computer Engineering Program for the Bachelor of Science degree. The Department of Electrical and Computer Engineering also offers a Computer Engineering Program for the Master of Science degree.

Computer Engineering Profession

As digital computer use pervades daily life, computer engineers have designed computers and devised applications to improve the efficiency and quality of nearly all activities in business, industry, government, education and entertainment. Computer engineering draws heavily on electrical engineering topics, including electronic circuit design and analysis of physical communication and control systems, and on computer science topics, including logic design, system architecture, computer software and algorithms.

Computer engineers are in the midst of exciting times with unlimited, rapidly expanding opportunities. Engineers interact with and design supercomputers and the ubiquitous personal and portable computers. Computer engineers also play a key role in networking computers with other computers and intelligent devices. Computer engineers undertake a range of projects-from designing specialized computer hardware and reconstructing the human genome, to monitoring and controlling industrial plants and the environment, to computer graphics, robotics and the design of biomedical devices and computer networks. In addition, computer engineers design and develop hardware and embedded software-hardware systems. Importantly, computer engineers collaborate on projects that advance biology, medicine and nanoscience.

The Computer Engineering Program provides an outstanding, cutting-edge education in computer systems with emphasis on hardware and software. Toward that goal, the Computer Science and Engineering and Electrical and Computer Engineering departments incorporate the latest market and technology trends and combine the traditional disciplines of electronics, communications, control and computer programming with newer courses that include Cyber Security, Nanoscale Circuit Design, Parallel Computers, Image Processing, Biomedical Instrumentation, Web Search Engines, Wireless Networks, Peer-to-Peer Networks, SoC (System-on-a-Chip), VLSI (Very Large Scale Integration) and Game Development.

NYU Tandon has developed a strong design faculty through sponsored research programs, many of which are coordinated in NYU Tandon's Center for Advanced Technology in Telecommunications (CATT), Information Systems and Internet Security (ISIS) Lab and Wireless Internet Center for Advanced Technology (WICAT).

Additional information about computer engineering careers can be found here.

Undergraduate Program

The Computer Engineering, B.S. gives a broad-based background in computer engineering to prepare students for immediate employment as entrepreneurs or in industry and government or for graduate study.

Goals and Objectives

The undergraduate program achieves the following objectives for students:

- Graduates are expected to be engaged and advancing in their professional careers in a profession that utilizes their NYU Tandon degree, in Computer Engineering or other career path, that include industry, academia and governmental or nongovernmental organizations.
- Graduates are expected to be seeking continuous professional development and life-long learning through graduate school studies, continuing education credits and/or professional registration.

The BS program includes analysis and design courses in major computer engineering areas that build on fundamental courses in mathematics and science. Many courses include hands-on laboratory components. A variety of electives provide depth and specialization, many in commercially viable areas such as high-speed networks, databases, embedded control systems, VLSI, image processing , computer and network security and Web search.

Since most current engineering design is computer facilitated, the department includes computer-aided design (CAD) programs in many undergraduate courses to emphasize possibilities for large-scale design, corrections for unmodeled complexities, trade-offs among performance criteria and real-time simulations. The senior design project challenges each student to integrate analytical and design concepts from earlier courses to design a device or system to meet specified performance requirements.

The program recognizes that communication and interpersonal skills are essential to a successful career. Students are required to take writing-intensive courses and electives in the humanities and social sciences. They also develop those skills in design-course team projects. The Computer Engineering Program stays current with market changes through the CATT Industrial Affiliates Program, hiring professors and parttime adjunct teachers with industrial experience, frequent contacts with alumni, review of professional journals and by encouraging faculty to work in industry part-time or while on sabbatical. Where possible, classroom work challenges students to apply knowledge to current design situations. The curriculum, reflecting industry's need for the engineering-systems approach, employs senior projects in control and robotics, advanced hardware design, imaging and embedded controllers. Economic aspects of engineering are addressed by allowing undergraduates to choose electives such as economics/finance, psychology and ethics. Cost evaluation is required in design projects for EG 1003 Introduction to Engineering and Design. Senior projects emphasize time management and planning. EG 1001 Engineering and Technology Forum examines the impact of technology on society. ECE 1012 /CS 1012 Introduction to Computer Engineering introduces students to the field of computer engineering. Exceptional undergraduate students may do advanced study in two programs:

- The BS/MS Program (please refer to the section "Undergraduate Academic Requirements and Policies" section in the catalog).
- The summer junior-research internship program, in which undergraduates work with faculty on research projects.

Up-to-date information about program requirements, course offerings, senior project topics and research projects is available here from the Department of Electrical and Computer Engineering and from the Department of Computer Science and Engineering here.

Undergraduate Degree Requirements

The BS program in computer engineering gives students broad preparation for a career in computer engineering in any of its specialization and readies them for immediate employment in industry, business and government, or for further graduate education. The program is accredited by the Accreditation Board for Engineering and Technology (ABET).

The table at the end of this section outlining the Typical Course of Study for a BS shows a sample semester-by-semester program. The notes accompanying the table are an essential part of the table. Students are responsible for making themselves aware of changes made in this program after this catalog is published. Those changes are posted outside the department's advising offices and on the department's Web page.

Senior Design Project

The two-semester Senior Design Project allows students to focus on an application of computer engineering. In the first semester, students concentrate on hardware and/or software. They develop skills using specialized laboratory equipment and computer-design packages and are introduced to techniques for planning projects and making effective presentations. They also learn to balance design requirements such as performance, safety, reliability and cost effectiveness.

In the second and final semester, students design, build or simulate and test a device or system to meet prescribed engineering specifications. Informal and formal written and public oral presentations help prepare students for professional careers. Design-project students frequently work in groups or pairs to develop interaction skills essential to good engineering.

Graduation Requirements

NYU Tandon requires a 2.0 GPA in all courses and specifies other general requirements in the section "Undergraduate Degree Requirements and Academic Policies," which describes the core curriculum for all engineering majors, including placement procedures in writing, mathematics and programming; course credits by transfer and advanced placement; and credit by examination.

To graduate, students must (1) have a C-grade or better in ECE-UY 2004 Fundamentals of Electric Circuits, and (2) have a technical GPA of 2.0 based on all courses prefixed ECE, CS or EL. Seniors may elect graduate courses labeled EL 5XX3, but not CS 5XX3. To enroll in other graduate courses, student must meet required department GPA standards and adviser approval.

Students are expected to meet degree requirements in effect at the time when they first enrolled in an NYU Tandon program. Those requirements apply as long as a student remains in good standing and less than eight years have elapsed since entering the program. The period for unchanged requirements is proportionately less for a transfer student.

Good Standing, Probation and Disqualification

Students who fail to meet NYU Tandon GPA requirements or other conditions of adequate progress toward completing a degree are put on probation. (See the Undergraduate Academic Requirements and Policies section in this catalog for more details.) Students on final probation may not register for courses in one semester until grades are available from their previous semester's courses, and they are limited to a reduced number of credits per semester. Students who improve academic performance are removed from probation and returned to good standing. Continued poor academic performance can lead to final probation and, eventually, disqualification from the School. To remain in good standing in the undergraduate Computer Engineering Program, students must:

- Maintain, term-by-term and cumulatively, a technical GPA (based on ECE/EL and CS Earn a C- or better in ECE-UY 2004 Fundamentals of Electric Circuits.

AND

- Fulfill all course pre- and co-requisites.

Students who face difficulties, whether educational or personal, should consult their instructor or a departmental adviser at the earliest possible time. Students who do not meet program conditions are placed on departmental probation.

Probation conditions may require students to:

- Repeat courses, including courses in which they received transfer credits and courses in which they received a C grade or less at NYU Tandon;
- Specify their credit load and permissible withdrawals; and

- Take other remedial programs.

Students who fail to meet departmental probation requirements, fail three times to earn the required grade in any one course or do not conform to the University Code of Conduct are subject to disqualification from working toward a bachelor's in computer engineering or taking further computer engineering courses. Actions taken depend on individual cases. Disqualified students may appeal in writing. Students also may apply for readmission after two terms (fall, spring or summer) have passed if they can demonstrate an improved chance of success.

Dual Undergraduate Majors

With departmental permission, students may earn a single bachelor's degree in electrical and computer engineering. The dual major in electrical and computer engineering requires a total 141 credits rather than the usual 128 required for individual bachelor's degrees.

Senior Thesis

Undergraduate computer engineering students wishing to do a Senior Thesis (BS thesis) instead of Design Project (DP) must:

- Complete 6 total credits of Senior Thesis (ECE-UY 397);
- Complete ECE-UY 4001, "ECE Professional Development and Presentation";
- Make a presentation to their thesis adviser, with attendance open to other students and faculty; and
- Bind their thesis according to university guidelines for MS and PhD theses.

Note: Such students need not register for Design Project I or Design Project II.

Before registering for Senior Thesis, the student must find a faculty member to serve as thesis adviser. In addition, students must have a 3.0 GPA in order to register for Senior Thesis instead of Design Project.

Additional notes:

- The Senior Thesis must be design oriented.
- The 6 credits of DP-1 and DP-2 are replaced by 6 credits of Senior Thesis (ECE-UY 397).
- Students are advised not to take all 6 credits of Senior Thesis during a single semester.

Transfer Students

Transfer credits for courses taken at other schools are based on evaluation of content and level. Students completing the same program at another school, but in different years, may receive different amounts of transfer credits. Students should consult with a computer engineering undergraduate adviser for current information.

Transfer students must arrive and present their records for evaluation at least one week before the regular registration period of their first semester at NYU Tandon. Transfer credits are awarded only for courses completed with C grades or better. Qualified students from two-year pre-engineering programs, such as those at liberal arts and community colleges, may fulfill the requirements for the BS in computer engineering in two additional years. Since pre-engineering programs vary, a prescribed program is not possible; consequently, students should consult with an NYU Tandon undergraduate adviser at the beginning of their pre-engineering program.

Guidance for Undergraduate Students

Instructors help students in their courses during hours posted on their doors or by appointment. Students taking project or thesis courses work closely with faculty project advisers. Computer engineering advisers in the undergraduate ECE office are available for advice on courses and program adjustments resulting from academic needs or personal problems. The Polytechnic Tutoring Center provides drop-in tutoring. Personalized career counseling is available at the Wasserman Center for Career Development. The EG 1001 Engineering and Technology Forum and ECE 1012/CS 1012 Introduction to Computer Engineering introduce students to NYU Tandon and its curricula. Fellow students are an excellent source of advice on adjusting to the School environment and the demands of an engineering program. In addition to meeting students in class, students are urged to meet others who can offer experienced advice by joining clubs such as the student branches of NYU Tandon for Electrical and Electronics Engineers (IEEE) and Association for Computing Machinery (ACM) professional societies or other technical, sport, religious and ethnic clubs.

Students are encouraged to meet with other students to form study groups. In doing so, they benefit both from explanations provided by others and by the deeper understanding they get when they explain a concept or technique to someone else.

Undergraduate Advising

Undergraduate advising information is available on the Department of Electrical and Computer Engineering's website. Students should consult that page for further details on honors, probation, approved electives, projects, elective concentrations, course offerings, senior project topics and other interests. Curriculum and prerequisite changes, new courses, special sections and other last-minute announcements are also posted on the bulletin boards outside the Office of Electrical and Computer Engineering.

Information

All students are responsible for keeping informed about current procedures and regulations. Descriptions of undergraduate electrical engineering and computer science courses used in the Computer Engineering Program are in the program sections of this catalog.

Graduate Program

The Computer Engineering, M.S. educates professionals in computer engineering by offering graduate courses that meet the current and projected needs of industry and government in the metropolitan New York area and beyond. The program promotes computer engineering through basic and applied research by faculty and students in collaboration with industry and government agencies.

NYU Tandon's MS program in computer engineering targets two important needs:

- The program leads to a terminal degree for students intending to round out their education and seek employment.
- The program provides the tools and background to carry out self-directed research for students planning a PhD. Outstanding students should apply for financial aid, including research fellowships, teaching fellowships or partial tuition remission. Students who wish to continue graduate study toward a PhD in computer engineering may do so in the PhD in the Electrical Engineering Program.

The electrical engineering and computer science faculty's research and teaching interests include computer networks, VLSI design and CAD, verification and testing of VLSI systems, embedded systems design and computer architecture. The MS in Computer Engineering focuses on the principles and concepts underlying the design and integration of computer hardware and software into components and systems.

Modern society's need for sophisticated and efficient electronically controlled systems and devices is increasing exponentially. Advanced studies in computer engineering provide a needed bridge between the Institute and industry.

The Department of Electrical and Computer Engineering develops and administers an exceptional academic and research program in computer engineering with strong focus on telecommunications, computer networks and microelectronics.

Goals and Objectives

The MS program in computer engineering prepares graduates to practice computer engineering at an advanced level. The program's specific goals and objectives provide students with:

- Opportunities to specialize in primary subdisciplines of computer engineering (VLSI, High-Speed networking, etc.), or to achieve breadth across a number of the sub-disciplines;
- Analysis and design knowledge necessary to design general-purpose as well as specialized application-specific computer hardware;
- Knowledge and skills to design embedded software-hardware systems;
- Exposure to state-of-the-art computer engineering techniques and technologies such as new computer architectures and design styles; and
- A basis for continued lifelong learning in the profession.

Admission Requirements

Admission to the MS program requires a bachelor's degree in computer engineering, electrical engineering or computer science from an accredited institution. Students not meeting these requirements are considered individually for admission and may be admitted after completion of courses to remove preparation deficiencies, including courses in logic circuit design, state analysis and synthesis techniques, computer architecture, data structures and algorithms and C or C++ programming.

Non-Degree

Computer Engineering Minor

Required Courses

Students may obtain a minor in Computer Engineering by taking the following courses:

- ECE-UY 2004 Fundamentals of Electric Circuits *4 Credits*
- CS-UY 2204 Digital Logic and State Machine Design *4 Credits*
- ECE-UY 4144 Introduction to Embedded Systems Design *4 Credits*
- CS-UY 2124 Object Oriented Programming *4 Credits*
OR
ECE-UY 3114 Fundamentals of Electronics I *4 Credits*
(whichever is not required for the student's primary degree program)

Total Credits: 16

Note:

For students not earning the BS degree in computer science, ECE-UY 4144 may be replaced by CS-UY 2214 Computer Architecture. Students should be aware of the prerequisites for the courses for the minor. A GPA of 2.0 or better in the entire minor is required. Students must take a minimum of 8 credits at the School of Engineering. The minor in computer engineering is not open to students earning the BS degree in electrical engineering.

Contact Information:

Departmental Adviser: Richard Toth

rtoth@nyu.edu

Bachelor of Science

Computer Engineering, B.S.

Typical Course of Study for the Bachelor of Science in Computer Engineering

Freshman Year

Fall Semester: 16 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits* [2]
- EG-UY 1003 Introduction to Engineering and Design *3 Credits* [1]
- EG-UY 1001 Engineering and Technology Forum *1 Credits* [1]
- EXPOS-UA 1 Writing the Essay *4 Credits*

Spring Semester: 17 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- CS-UY 1134 Data Structures and Algorithms *4 Credits* [2]
- ECE-UY 1012 Introduction to Computer Engineering *2 Credits* [1]
  OR
- ECE-UY 1002 Introduction to Electrical and Computer Engineering *2 Credits* [1]
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Sophomore Year

Fall Semester: 16 Credits

- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*

- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- CS-UY 2124 Object Oriented Programming *4 Credits* [2]
- ECE-UY 2004 Fundamentals of Electric Circuits *4 Credits*

Spring Semester: 15/16 Credits

- MA-UY 2314 Discrete Mathematics *4 Credits*
- Math/Science Elective *3-4 Credits*
- CS-UY 2204 Digital Logic and State Machine Design *4 Credits* [2]
- ECE-UY 3114 Fundamentals of Electronics I *4 Credits*

Junior Year

Fall Semester: 15/17 Credits

- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- Math/Science Elective *3-4 Credits*
- CS-UY 2214 Computer Architecture and Organization *4 Credits*
- ECE/CS Elective *3-4 Credits*
- ECE-UY 4001 ECE Professional Development and Presentation *1 Credits*

Spring Semester: 14/16 Credits

- MA-UY 2224 Data Analysis *4 Credits*
- ECE-UY 4144 Introduction to Embedded Systems Design *4 Credits*
- Humanities and Social Sciences Elective Course *4 Credits* [3]
- Free Elective *3-4 Credits*

Senior Year

Fall Semester: 17/18 Credits

- ECE/CS 4XX3 Design Project *3 Credits*
- ECE/CS Elective
- Humanities and Social Sciences Elective Course *4 Credits* [3]
- Free Elective *3 Credits*
- Free Elective *3-4 Credits*

Spring Semester: 16/18 Credits

- ECE/CS 4XX3 Design Project II *3 Credits*
- Humanities and Social Sciences Elective Course *4 Credits* [3]
- Humanities and Social Sciences Elective Course *4 Credits* [3]
- Free Elective *3-4 Credits*
- Free Elective *3 Credits*

Total credits required for graduation: 128

Notes

Note: A GPA (Technical) of at least 2.0 is required in all ECE and CS courses.

[1] For transfer students and students changing major, ECE-UY 1002 Introduction to Electrical and Computer Engineering or ECE-UY 1012 Introduction to Computer Engineering is not required. EG-UY 1001 Engineering and Technology Forum and EG-UY 1003 Introduction to Engineering and Design may also be excused depending upon transfer credits.

[2] Grades of at least C- are required in CS-UY 1114, CS-UY 1134, CS-UY 2124, CS-UY 2204, and ECE-UY 2004. C if repeated twice.

[3] Choice of humanities and social sciences electives must conform to the established requirements of the Technology, Culture and Society Department. After the first-year writing courses, students will need *one writing intensive elective course (W)*. In addition, one of the four courses **must be a Junior or Senior-level course.**

Electrical Engineering and Computer Engineering (dual major), B.S.

With departmental permission, students may earn a single bachelor's degree in electrical and computer engineering. This degree requires a total of minimum 141 credits rather than the usual 128 required for individual bachelor's degrees.

Note: A GPA (technical) of at least 2.0 is required in all ECE-UY, CS-UY and ECE-GY courses.

Please note that the curriculum that follows applies to students who began classes in the Fall of 2016 or later. For students who entered the NYU Tandon School of Engineering prior to that date, please review the curriculum and typical course schedule for students entering prior to Fall 2016.

Typical Course of Study for the Bachelors of Science in Electrical Engineering and Computer Engineering (dual major)

First Year

Fall Semester: 16 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits* [1]
- EG-UY 1001 Engineering and Technology Forum *1 Credits* [1]
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits* [2]
- EXPOS-UA 1 Writing the Essay *4 Credits*

Spring Semester: 17 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits*

- PH-UY 1013 Mechanics *3 Credits*
- ECE/CS 1012 Introduction to Computer Engineering *2 Credits* OR ECE-UY 1002 Introduction to Electrical and Computer Engineering *2 Credits* [1]
- CS-UY 1134 Data Structures and Algorithms *4 Credits* [2]
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Second Year

Fall Semester: 20 Credits

- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- CS-UY 2124 Object Oriented Programming *4 Credits* [2]
- ECE-UY 2004 Fundamentals of Electric Circuits *4 Credits* [2]
- Humanities and Social Sciences Elective *4 Credits* [3]

Spring Semester: 20 Credits

- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- MA-UY 2314 Discrete Mathematics *4 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- CS-UY 2204 Digital Logic and State Machine Design *4 Credits* [2]
- ECE-UY 3114 Fundamentals of Electronics I *4 Credits*

Third Year

Fall Semester: 17/18 Credits

- MA-UY 3113 Advanced Linear Algebra and Complex Variables *3 Credits*
- ECE-UY 2233 Introduction to Probability *3 Credits* OR MA-UY 2233 Introduction to Probability *3 Credits*
- CS-UY 2214 Computer Architecture and Organization *4 Credits*
- ECE-UY 3054 Signals and Systems *4 Credits* [2]
- ECE Elective *3 Credits*

Spring Semester: 18/20 Credits

- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- ECE-UY 3604 Electromagnetic Waves *4 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]
- ECE/CS Restricted Elective *3/4 Credits* [4]
- ECE/CS Restricted Elective *3/4 Credits* [4]

Fourth Year

Fall Semester: 17/19 Credits

- ECE-UY 4001 ECE Professional Development and Presentation *1 Credits*
- ECE/CS 4XX3 Design Project I *3 Credits*
- ECE/CS Restricted Elective *3/4 Credits* [4]
- ECE/CS Restricted Elective *3/4 Credits* [4]
- Free Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Spring Semester: 16/17 Credits

- ECE/CS 4XX3 Design Project II *3 Credits*
- ECE/CS Elective *3 Credits*
- ECE/CS Elective *3 Credits*
- ECE/CS Restricted Elective *3/4 Credits* [4]
- Humanities and Social Sciences Elective *4 Credits* [3]

Total Credits Required for the Degree: 141

Notes

1. For transfer students and students changing their major, "Introduction to Computer Engineering" is not required. EG-UY 1001 Engineering and Technology Forum and EG-UY 1003 Introduction to Engineering and Design may also be excused depending on transfer credits.

2. Grades of at least C- are required in CS-UY 1114, CS-UY 1134, CS-UY 2124, CS-UY 2204, ECE-UY 2004 and ECE-UY 3054. C if repeated twice.

3. Choice of a HuSS electives must conform to the established requirements of the Technology. Culture and Society Department. After the first-year writing sequence, students will need **one writing intensive course (W)**. In addition, one of the four courses must be a *Junior or Senior level course*.

4. An ECE/CS restricted elective is any course that a student has the pre-requisites for and is on the list of ECE/CS Restricted Electives announced by the Computer Science and Engineering and Electrical and Computer Engineering Departments or on the list of ECE Restricted Electives announced by the Electrical and Computer Engineering Department.

- Students must choose at least two (2) courses from the ECE Restricted Electives list.
- Among the remaining three, students must one (1) CS course, one (1) EE course, and one from CS or ECE from the set of CS Restricted Electives and ECE Restricted Electives both of which are updated by the two departments.

Master of Science

Computer Engineering, M.S.

Degree Requirements

Entrance Requirements

Admission to the MS program requires a bachelor's degree in computer engineering, electrical engineering or computer science from an accredited institution. Students without such prior degrees must complete appropriate undergraduate courses to remove any deficiencies in preparation. Topics in which deficiencies must be removed include logic circuits design, state analysis and synthesis techniques, computer architecture, data structures and algorithms and C or C++ programming. The Graduate Record Exam (GRE) is required for all applicants.

Course Requirements

To obtain the MS degree in Computer Engineering, students must complete a total of 30 credits, with restrictions described below.

Core Courses (6 Credits):

The core courses cover fundamental material and should be taken as early as possible. An advanced course subsequent to a core course may be taken in lieu of the core course, upon by the program advisor. All students must choose two out of the following core courses:

- ECE-GY 6913 Computing Systems Architecture *3 Credits*
- ECE-GY 6463 Advanced Hardware Design *3 Credits*
- ECE-GY 6473 Introduction to VLSI System Design *3 Credits*
- ECE-GY 6483 Real Time Embedded Systems *3 Credits*
- ECE-GY 5373 Internet Architecture and Protocols *3 Credits*
  (Note that ECE-GY 6913 is a newly developed course that replaces CS-GY 6133 Computer Architecture I as a core course. ECE students interested in computer architecture should take this course instead of CS-GY 6133. CS-GY 6133 will be approved as a core course for MS-CE only if it was taken prior to Fall 17.)

Electives (24 Credits):

At least 24 out of 30 credits should be ECE-GY prefixed courses including the core courses. Up to two non-ECE courses (equivalent to six credits) can be taken from other science, engineering, or management departments at NYU. The total number of credits for 5000-level ECE courses and non-ECE courses cannot exceed 12 credits. Note that CP-GY 9911 and CP-GY 9921 can be counted towards the ECE-GY course requirement. Furthermore, credits from 5000-level courses from other departments cannot be counted towards MS/CE degree, except with approval by Program Director.

Project requirement (3 Credits):

One 3-credit advanced project in ECE/CSE (ECE-GY 9953 or CS-GY 9963) is required. Certain courses with significant project component may be used to partially satisfy the project requirement, subject to approval by the program director.

Note about CS-GY 6843 Computer Networking:

We expect most students have covered this material in an undergraduate course. Therefore students can only take this course in exceptional cases and only if approved by Professor Yong Liu.

Thesis, project, and reading

Students are encouraged to participate in research by registering for a master's thesis (ECE-GY 997x , 6 credits, can be taken over two semesters), an advanced project (ECE-GY 9953 or ECE-GY 9963, 3 credits each, ECE-GY 9941, 1.5 credits) or a reading course (ECE-GY 9933, 3 credits). Students must secure a faculty member's commitment for advising such individual studies. Oral defense of the master's thesis with at least three professors (at least 2 ECE professors) in attendance is required. For the project and reading courses, a project report and an oral presentation is required. The total credits for thesis, projects, readings, and internships (see below) should not exceed 9 credits within the 30 credits required for the MS degree.

Internships:

International students must register for an internship course (CP-GY 9911, CP-GY 9921, 1.5 credit each) to do an internship. Up to 3 credits of approved internships can be applied towards the 30 credits MS degree requirement. International students cannot do internship after they have completed the degree requirement. For an internship to be approved for credits, the internship job must provide industry and/or research experience relevant to the Electrical Engineering degree program. All internships must be approved and supervised by an ECE faculty member. Students must secure a faculty member's commitment for advising an internship. The internship supervisor should submit a midterm and a final term evaluation report to the advisor. The student must submit a project report to the faculty advisor upon completion of the internship for the evaluation and grading of the internship course. The total credits for independent studies including MS thesis, projects, reading, and internship cannot exceed 9 credits within the 30 credits towards the MS degree. Note that CP-GY 9911 and CP-GY 9921 can be counted towards the ECE-GY course requirement. However, if a student has already taken more than 7.5 credits of independent studies, he/she will not be approved for another CP course.

Transfer Credits:

No transfer credits are accepted towards the MS degree.

GPA Requirements:

An overall GPA of 3.0 or above in all graduate courses taken at NYU is required. In addition, an average of 3.0 is required among the two core courses.

Graduate Manual

For more information, please refer to the graduate manual, which can be found on the student resources page: https://engineering.nyu.edu/academics/departments/electrical-and-computer-engineering/student-resources

Electrical Engineering

Undergraduate Program Director:
Francisco de Leon
Graduate Program Director:
Zhong-Ping Jiang

The Department of Electrical and Computer Engineering offers an Electrical Engineering Program for the degrees Electrical Engineering, B.S., Electrical Engineering, M.S. and Electrical and Computer Engineering, Ph.D.

The Profession

The rapidly growing profession of electrical engineering has evolved from its early beginnings in electric-power generation and distribution through the development of radio, television, control and materials to computers, telecommunications and health care. In the last century, electrical engineers have created advances in power distribution, computers and communications that have changed the world. Their inventions have made the world a smaller, safer place and allow for immediate reporting and images from distant places that make world events part of daily life.

While electrical engineering undergraduate and graduate students concentrate on areas of electrical science, graduates apply their training to diversified fields such as electronic design, bioengineering, city planning, astronautics, radio astronomy, system engineering, image processing, telemetry, the Internet, computer design, management and patent law. As students mature and realize their abilities, they may choose professional careers in engineering, government, sales or education.

The expertise of NYU Tandon's electrical engineering faculty covers a wide range of fields. Principal areas of teaching and research are computer engineering, telecommunications, wireless communications, signal processing, systems and control engineering, power systems and energy conversion, machine learning, electrooptics and electroacoustics, microwave engineering, plasma science and engineering, and microelectronic devices and systems.

Additional information about electrical engineering careers can be found via IEEE.

Undergraduate Program

The BS program in Electrical Engineering gives student a broad-based background in electrical engineering, preparing them for immediate employment in industry or government or for graduate study.

Goals and Objectives

The objectives of the Electrical Engineering Program are that graduates are expected to:

- Be engaged and advancing in their professional careers in a profession that utilizes their NYU Tandon degree, in Electrical Engineering or other career path, that include industry, academia, and governmental or non-governmental organizations.
- Be seeking continuous professional development and life-long learning through graduate school studies, continuing education credits and/or professional registration.

The BS program includes analysis and design courses in major electrical engineering areas that build on fundamental mathematics and science courses. Many courses include hands-on laboratory components. Undergraduates can choose from a variety of electives to provide depth and specialization, many in commercially viable areas such as local area networks, wireless communication and deregulated power systems.

Since most current engineering design is computer-facilitated, the department includes computer-aided design (CAD) programs in many undergraduate courses to emphasize possibilities for large-scale design, corrections for unmodeled complexities, trade-offs among performance criteria, and real-time simulations. A senior design project challenges each student to integrate analytical and design concepts from earlier courses to design a device or system to meet specified performance requirements.

The program recognizes that communication and interpersonal skills, developed in design-course team projects, are essential to a successful career in any profession. Students also must take writing intensive courses and elective courses in humanities and social sciences.

Students are taught by faculty familiar with current issues through sponsored-research programs, such as those coordinated by NYU Tandon's Center for Advanced Technology in Telecommunications (CATT), a World Wide Web lab, and many research grants awarded to individuals or groups of professors.

The Electrical Engineering Program keeps abreast of market changes through the CATT Industrial Affiliates Program and by hiring professors and part-time adjunct teachers with industrial experience, initiating frequent alumni contacts, reviewing professional journals and encouraging faculty to work in industry part time or while on sabbatical. Where possible, classroom work challenges students to apply their knowledge to current design situations. Students also apply broad technical knowledge to practical problems through interdepartmental cooperation. The curriculum employs senior projects to reflect Industry's need for an engineering-system approach. Topics include control and robotics, advanced hardware design, imaging, wireless communications, power electronics and areas mentioned above. Engineering's economic aspects are addressed by allowing undergraduates to choose electives, such as macro/micro economics, psychology, ethics and management process. Cost evaluation is required in the design projects for EG-UY 1003 Introduction to Engineering and Design . Senior projects emphasize time management and planning.

Exceptional undergraduate students have the opportunity for advanced study in two programs: (1) the BS/MS Program (please refer to the Undergraduate Academic Requirements and Policies section of the catalog), and (2) the summer junior-research internship program, in which undergraduates work on research projects with graduate students and their advisers. Up-to-date information about program requirements, course offerings, senior-project topics and research projects is available from the Department of Electrical and Computer Engineering.

Undergraduate Degree Requirements

The undergraduate electrical engineering program prepares students broadly for a career in electrical engineering in any of its specializations and readies them for immediate employment in industry, business and government, entrepreneurial endeavors or for further graduate education. The program is accredited by the Accreditation Board for Engineering and Technology (ABET).

The Electrical Engineering, B.S. Typical Course of Study shows a typical semester-by-semester program for students entering as freshmen in fall 2016 or later. The notes are an essential part of the table. Students are responsible for making themselves aware of possible changes in this program after the publication of this catalog. Those changes are posted outside the department's advising offices and on the department's website. (Students who started their studies before fall 2016 should consult the previous edition of this catalog or the department's website for program and course requirements applicable to them.)

Senior Design Project

In the two-semester senior Design Project, students focus on one aspect of electrical engineering. In the first semester, students develop skills using specialized laboratory equipment and computer-design packages, are introduced to techniques for planning projects and making effective presentations and learn to balance such design requirements as performance, safety, reliability and cost effectiveness. In the final semester, students design, build or simulate and test a device or system to meet prescribed engineering specifications.

Informal and formal written and public oral presentations help prepare students for professional careers. Design project students frequently work in groups or pairs to develop interaction skills essential to good engineering.

Graduation Requirements

The School requires a 2.0 GPA in all courses and specifies other general requirements in the section Undergraduate Academic Requirements and Policies. This section describes the core curriculum for all engineering majors, including placement procedures in writing, mathematics and programming, course credits by transfer and advanced placement and credit by examination.

To graduate, students must (1) have a C-grade or better in CS-UY 1133, CS-UY 2204, ECE-UY 2013, ECE-UY 2024 and ECE-UY 3054 and (2) have a technical GPA of 2.0 based on all courses prefixed EE, CS or EL. Seniors may elect graduate courses labeled ECE 5XX3, but not CS 5XX3. To enroll in other graduate courses, seniors must have a 2.7 GPA or better in related courses and adviser approval; juniors must have a 3.0 GPA or better and adviser approval.

Students are expected to meet the degree requirements in place when they first enrolled in a NYU Tandon program. Those requirements apply as long as students remain in good standing and fewer than eight years have elapsed since they entered the program. The period for unchanged requirements is proportionately less for a transfer student. (Students who started their studies before fall 2013 should consult the department's website for applicable program and course requirements.)

Good Standing, Probation and Disqualification

Students who fail to meet NYU Tandon GPA requirements or other conditions of adequate progress toward completing a degree are put on probation. (See the Undergraduate Academic Requirements and Policies section of this catalog for more details.) Students on final probation may not register for courses until grades are available from their previous semester's courses, and they are limited to a reduced number of credits per semester. Students who improve their academic performance are removed from probation and returned to good standing. Continued poor academic performance can lead to final probation and, eventually, disqualification from the Institute.

To remain in good standing in the undergraduate Electrical Engineering Program, students must:

1. Maintain, term-by-term and cumulatively, a technical GPA (based on EE, ECE and CS courses) and an NYU Tandon GPA of 2.0 or better;
2. Earn a C- or better in each of the four courses specified above; and
3. Fulfill all course pre- and co-requisites.

Students facing difficulties, educational or personal, should consult their instructor or a departmental adviser as soon as possible. Students who do not meet program conditions are placed on departmental probation. Probation conditions may require students to:

1. Repeat courses, including courses in which they received transfer credit and courses in which they received a C grade or less at NYU Tandon;
2. Specify their credit load and permissible withdrawals; and
3. Take other remedial programs.

Students who fail to meet departmental probation requirements, fail three times to earn the required grade in any one course or do not conform to the University Student Code of Practice are subject to disqualification from working toward a bachelor's in electrical engineering or from taking further electrical engineering courses. Actions taken depend on individual cases. Disqualified students may appeal in writing. Students also may apply for readmission after two terms (fall, spring or summer) have passed if they can demonstrate an improved chance of success.

Dual Undergraduate Majors

With departmental permission, students may earn a Electrical Engineering and Computer Engineering (dual major), B.S. This degree requires 141 credits rather than the usual 128 required for individual bachelor's degrees.

Transfer Students

Transfer credits for courses taken at other schools are based on evaluation of content and level. Students completing the same program at another school, but in different years, may receive a different number of transfer credits. Students should consult an electrical engineering undergraduate adviser for current information.

Transfer students must arrive and present their records for evaluation at least one week before the regular registration period of their first semester at NYU Tandon. Transfer credits are awarded only for courses completed with C grades or better.

Qualified students from two-year preengineering programs, such as those at liberal-arts and community colleges, may fulfill the requirements for the BS in Electrical Engineering in two additional years. Since pre-engineering programs vary, a prescribed program is not possible; consequently, students should consult with a NYU Tandon undergraduate adviser at the beginning of their pre-engineering program.

Technology-program graduates may be able to fulfill the requirements for the BS in Electrical Engineering in two to three and a half years, depending on the scope and level of their previous education. Consult with an undergraduate adviser for details.

Senior Thesis

Undergraduate electrical engineering students wishing to do a Senior Thesis (BS thesis) instead of Design Project (DP) need not register for DP I or DP II, but they must:

1. Complete 6 total credits of Senior Thesis (ECE-UY 397);
2. Complete ECE-UY 4001 ECE Professional Development and Presentation;
3. Make a presentation to their thesis adviser that is open for other students and faculty to attend; and
4. Bind their thesis according to Institute guidelines for MS and PhD theses.

Before registering for Senior Thesis, the student must arrange for a faculty member to serve as thesis adviser. In addition, students must have a 3.0 GPA to register for Senior Thesis instead of Design Project.

Additional notes:

1. The Senior Thesis must be design oriented.
2. The 6 credits of DP I and DP II are replaced by 6 credits of Senior Thesis (ECE-UY 397).
3. The department advises that the 6 credits of Senior Thesis not be all taken in a single semester.

Guidance for Undergraduate Students

Instructors provide help for their students during hours posted on their doors or by appointment. Students taking project or thesis courses work closely with faculty project advisers. Electrical engineering advisers in the undergraduate ECE office are glad to advise on courses and program adjustments that result from academic needs or personal problems.

EG-UY 1001 Engineering and Technology Forum and ECE-UY 1002 Introduction to Electrical and Computer Engineering, introduce students to technology in society and to the School's curriculum for electrical engineering. The Trio Scholars Program sponsors a peer-tutoring program. The Polytechnic Tutoring Center provides drop-in tutoring. Personalized career counseling is available at the Wasserman Center for Career Development. Fellow students can offer excellent advice on how to adjust to the Institute environment and the engineering program and its demands. Outside class, students are urged to meet others who can give experienced advice by joining clubs such as the student branch of the Institute for Electrical and Electronics Engineers (IEEE) professional society, and other technical, sports, religious and ethnic clubs.

Students are advised to study and to do homework with other students. Everyone benefits and gains a deeper understanding when they explain a concept or technique to someone else.

Information

Undergraduate advising information is available on the Department of Electrical and Computer Engineering's website. Students should consult that site for details on honors, probation, approved electives, projects, elective concentrations, course offerings and senior project topics. Curriculum and prerequisite changes, new courses, special sections and other last-minute announcements are also posted on bulletin boards outside the undergraduate and graduate Office of Electrical and Computer Engineering Advising. All students are responsible to stay informed about the latest procedures and regulations.

Graduate Programs

The Department of Electrical and Computer Engineering offers a graduate Electrical Engineering Program leading to graduate certificates and Master of Science, Master of Engineering and Doctor of Philosophy degrees as listed below.

Requirements for graduate degrees in electrical engineering are general. Each student may follow a program in any one of many fields, including those described below. For up-to-date information, students should refer to the Department of Electrical and Computer Engineering Graduate Student Manual. This publication, revised annually, is available from the department's graduate office and on-line.

Outstanding students should apply for financial aid, including research assistantships, teaching assistantships or partial tuition remission.

Goals and Objectives

The Electrical Engineering, M.S. prepares graduates for a professional career as an entrepreneur, a practicing engineer in industry, business or government at an advanced level or to pursue the PhD degree in electrical engineering. Three core courses, two one-year sequences and electives provide breadth and depth across a number of electrical engineering subdisciplines.

The Electrical and Computer Engineering, Ph.D. prepares graduates for a research career in electrical engineering and university-level teaching. The program provides students with strong fundamental knowledge in several electrical engineering disciplines, skills for independent research in a subdiscipline and the ability to prepare and defend a dissertation representing an original and significant contribution for publication in a recognized scientific or engineering journal.

Concentrations

Wireless Communications

Wireless communication has exploded in growth since cellular telephones were introduced. This growth has popularized other services such as wireless local area networks (WiFi), wireless wide area networks (WiMAX), Bluetooth and HomeRF. Major paradigm shifts from exclusive reliance on wired networks to an era of tetherless communications, and from a fixed-computing to a mobile-computing environment are under way in the communications world. The merging of Internet and mobile communications is igniting unprecedented growth and an information-technologies revolution.

Computer Engineering

Computer Engineering deals with various systems, devices and chips for computing, control, security and communication purposes. Computer engineers design supercomputers, ubiquitous personal and portable computers, communication equipments security hardware, networking units, intelligent control modules and various embedded hardware-software devices.

Telecommunications and Networking

Telecommunications and networking manages systems such as telephone, television, radio transmission, radar, space communications and networks, including data networks, local area networks and the Internet. Program interests range from the design of components, such as switches and routers, to system and network design, performance analysis, modeling and protocols.

Signal Processing

Signal Processing is the theory and application of filtering, coding, transmitting, estimating, detecting, analyzing, recognizing, synthesizing, recording and reproducing signals by digital or analog devices or techniques. The term "signal" includes audio, video, speech, image, communication, geophysical, sonar, radar, medical, musical and other signals. Applications include: analyzing EKG and other biomedical signals for health monitoring; improving the quality of noisy, low-contrast X-ray images; digitally synthesizing the sound of musical instruments and creating new sounds; compressing music, images and video for faster transmission over the Internet and to make better use of limited memory in portable digital devices; detecting the position and velocity of objects in radar and sonar.

Image and Video Processing

This concentration focuses on the compression of image and video signals for efficient storage and transmission, and on basic image processing techniques such as contrast enhancement, deblurring, denoising and feature extraction. Applications include digital television, video streaming, medical imaging, digital library, and object recognition and tracking for surveillance.

Systems and Control

System engineers are concerned with modeling and predicting the behavior of large systems from knowledge of the component parts. Examples include air traffic control systems, health-care delivery systems, manufacturing systems, and systems to monitor and control pollution of the environment. Control engineers are concerned with all aspects of automatic regulation of system performance, which includes modeling of system behavior. Together with the system engineer, they are trained in the fields of automation and system theory. Typical examples of control systems are automatic guidance systems for aircraft and space vehicles, routing of packets in a telecommunication network, control of unmanned and robotic systems, electric motor control, and chemical process control.

Electronics and VLSI

The discipline involves designing and implementing circuits used in microcomputers, telecommunications, signal processing and control systems. Students learn to design such circuits with state-of the-art computer facilities and design tools. These circuits are fabricated with modern technologies such as CMOS, bipolar and GaAs. This discipline also involves the emerging area of nanoscale electronics, circuits and architectures and associated design tools.

Power Systems and Energy Conversion

Studies in power and energy include not only traditionally important generation, conversion and distribution of electrical power, but also modern smart-grid-related topics such as optimal power system control, operations and planning using emerging modeling and algorithmic techniques that bridge the gap between traditional power engineering and more recent data sciences.

Machine Learning

Machine Learning in the ECE Department focuses on both theory and a variety of real-life applications. The emphasis is on numerical optimization, deep learning, and large data analysis. The Machine Learning Lab collaborates with industry (IBM, NVIDIA, Google, and more) on various projects including autonomous cars and medical diagnoses. The lab also works on learning from data streams, learning with expert advice, supervised and unsupervised online learning, clustering, and structured prediction.

Plasma and Atmospheric Physics

This area centers on gas breakdown and ionization and the interaction of the resultant plasma with electromagnetic waves. These studies have applications in the propagation of high-power radio waves in the atmosphere and ionosphere.

Fields and Waves

Field and wave studies include electromagnetic and acoustic wave radiation and propagation under a variety of conditions, including non-linear, anisotropic and periodic media. Such studies include microwave waveguides and antennas, optical fibers, and integrated optics diffraction and scattering effects. Applications include radar, microwave and optical communications and wireless technology.

Non-Degree

Electrical Engineering Minor

Students may obtain a minor in Electrical Engineering by taking 15 credits of ECE prefixed courses. The courses may be any ECE course subject only to the prerequisite requirements. A GPA of 2.0 or better in the entire minor is required. Also, a grade of C- or better is required in Circuits (ECE-UY 2004).

A minimum of 8 credits in the minor must be taken at the School of Engineering. The Electrical Engineering minor is not open to Computer Engineering students.

Contact Information:

Departmental Adviser: Richard Toth

rtoth@nyu.edu

Bachelor of Science

Electrical Engineering, B.S.

Typical Course of Study for the Bachelor of Science in Electrical Engineering

Freshman Year

Fall Semester: 16 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits* [5]
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*

Spring Semester: 16/17 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- Math/Science Elective *3-4 Credits*
- ECE-UY 1002 Introduction to Electrical and Computer Engineering *2 Credits* [1]
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Sophomore Year

Fall Semester: 16 Credits

- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- ECE-UY 2004 Fundamentals of Electric Circuits *4 Credits* [4]
- CS-UY 2204 Digital Logic and State Machine Design *4 Credits* [4]

Spring Semester: 14/16 Credits

- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- Math/Science Elective *3-4 Credits*
- ECE-UY 3114 Fundamentals of Electronics I *4 Credits*
- CS-UY 1134 Data Structures and Algorithms *4 Credits*
  OR
- CS-UY 2163 Introduction to Programming in C *3 Credits*

Junior Year

Fall Semester: 17/18 Credits

- MA-UY 3113 Advanced Linear Algebra and Complex Variables *3 Credits*
- ECE-UY 2233 Introduction to Probability *3 Credits*
- ECE-UY 3054 Signals and Systems *4 Credits* [4]
- Free Elective *3-4 Credits*
- Humanities and Social Sciences Course *4 Credits* [2]

Spring Semester: 15/16 Credits

- ECE-UY 3604 Electromagnetic Waves *4 Credits*
- ECE Restricted Elective *4 Credits* [3]
- Free Elective *3-4 Credits*
- Humanities and Social Sciences Course *4 Credits* [2]

Senior Year

Fall Semester: 15/16 Credits

- ECE 4XX3 Design Project I *3 Credits* **OR** VIP-UY Course *3 Credits*
- ECE-UY 4001 ECE Professional Development and Presentation *1 Credits*
- ECE Restricted Elective *4 Credits* [3]
- Free Elective *3-4 Credits*
- Humanities and Social Sciences Course *4 Credits* [2]

Spring Semester: 16/18 Credits

- ECE 4XX3 Design Project II *3 Credits*
- ECE Elective *3-4 Credits*
- Free Elective *3-4 Credits*
- Free Elective *3 Credits*
- Humanities and Social Sciences Course *4 Credits* [2]

Total credits required for the degree: 128

Notes

[1] For transfer students and students changing major, ECE-UY 1002 is not required.

[2] Choice of Humanities and Social Sciences courses must conform to university requirements.

[3] The Restricted Electives must be 2 of 5 courses:

- ECE-UY 3124 Fundamentals of Electronics II
- ECE-UY 3824 Electric Energy Conversion Systems
- ECE-UY 3404 Fundamentals of Communication Theory
- ECE-UY 3064 Feedback Control

- ECE-UY 4144 Introduction to Embedded Systems Design

[4] A grade of at least C- is required in CS-UY 1114 or CS-UY 1133, CS-UY 2204, ECE-UY 2004, and ECE-UY 3054.

[5] CS-UY 1114 is strongly recommended, but CS-UY 1133 is also acceptable (for students changing major to EE, etc.).

Master of Science

Electrical Engineering, M.S.

Requirements for the Master of Science

Entrance Requirements

Admission to the Master of Science in Electrical Engineering Program requires a Bachelor's in Electrical and/or Computer Engineering from an accredited institution, with a GPA of 3.0/4.0 or higher. The Graduate Record Exam (GRE) is required for all applicants. Students who do not have a prior BS degree in Electrical and/or Computer Engineering but have strong background in their chosen focus areas of study and sufficient mathematics preparation may be considered for admission.

Course Requirements

To obtain the MS degree in Electrical Engineering, students must complete a total of 30 credits, with restrictions described below.

Degree Requirements

Core Courses:

The core courses cover fundamental material and should be taken as early as possible. An advanced course subsequent to a core course may be taken in lieu of the core course, upon approval by the MSEE program advisor. All students must choose two out of the following core courses:

- ECE-GY 6113 Digital Signal Processing I *3 Credits*
- ECE-GY 6253 Linear Systems *3 Credits*
- ECE-GY 6303 Probability and Stochastic Processes *3 Credits*
- ECE-GY 6713 Electromagnetic Theory and Applications *3 Credits*
- ECE-GY 6403 Fundamentals of Analog Integrated Circuit Design *3 Credits*

Concentration Areas:

Students are recommended to select courses to focus on one or two concentration areas, to obtain sufficient depth in the chosen areas. To provide flexibility for course selection based on the student's interests, a student does not need to officially declare a concentration, and no specific number of credits is required for each chosen centration. For an up-to-date list of concentration areas and courses for each area, please visit: http://archive.engineering.nyu.edu/academics/departments/electrical

Thesis, project, reading:

Students are encouraged to participate in research by registering for a master's thesis (ECE-GY 997x, 6 credits, can be taken over two semesters), an advanced project (ECE-GY 9953 or ECE-GY 9963, 3 credits each, ECE-GY 9941, 1.5 credits) or a reading course (ECE-GY 9933, 3 credits). Students must secure a faculty member's commitment for advising such individual studies. Oral defense of the master's thesis with at least three professors (at least 2 ECE professors) in attendance is required. For the project and reading courses, a project report and an oral presentation is required. The total credits for thesis, projects, readings, and internships (see below) should not exceed 9 credits within the 30 credits required for the MS degree.

Internships:

International students must register for an internship course (CP-GY 9911, CP-GY 9921, 1.5 credit each) to do an internship. Up to 3 credits of approved internships can be applied towards the 30 credits MS degree requirement. International students cannot do internship after they have completed the degree requirement. For an internship to be approved for credits, the internship job must provide industry and/or research experience relevant to the Electrical Engineering degree program. All internships must be approved and supervised by an ECE faculty member. Students must secure a faculty member's commitment for advising an internship. The internship supervisor should submit a midterm and a final term evaluation report to the advisor. The student must submit a project report to the faculty advisor upon completion of the internship for the evaluation and grading of the internship course. The total credits for independent studies including MS thesis, projects, reading, and internship cannot exceed 9 credits within the 30 credits towards the MS degree. Note that CP-GY 9911 and CP-GY 9921 can be counted towards the ECE-GY course requirement. However, if a student has already taken more than 7.5 credits of independent studies, he/she will not be approved for another CP course.

Out-of-department courses and 5000-level ECE courses:

At least 24 credits should be ECE-prefixed courses. The other 6 credits can be from any science, engineering or management departments. A 3-credit course taken at other science or engineering departments of NYU that is closely related to electrical engineering may be used to substitute an ECE-GY course upon approval by the MSEE program advisor. The total number of credits for 5000-level ECE courses and non-ECE courses cannot exceed 12 credits. (Note that CS-GY 6133 Computer Architecture I taken before Fall 17 will be counted as ECE-GY credits for this purpose.) Credits from 5000-level courses from other departments cannot be counted towards MS/EE degree, except with approval by the Program Director.

Note about CS-GY 6843 Computer Networking:

We expect most students have covered this material in an undergraduate course. Therefore, students can only take this course for credits towards MSEE degree in exceptional cases and only if approved by Professor Yong Liu.

Transfer Credits:

No transfer credits are accepted towards the MS degree.

GPA requirements:

An overall GPA of 3.0 or above in all graduate courses taken at NYU is required. In addition, an average of 3.0 is required among the two core courses.

Graduate Manual

For more information, please refer to the graduate manual, which can be found on the student resources page: https://engineering.nyu.edu/academics/departments/electrical-and-computer-engineering/student-resources

Doctor of Philosophy

Electrical and Computer Engineering, Ph.D.

Requirements for the Doctor of Philosophy

General

Graduate students who have exhibited a high degree of scholastic proficiency and have given evidence of ability for conducting independent research may consider extending their goals toward the doctorate. The Ph.D. degree is awarded after completing the program of study and research described below, and upon preparation and defense of a dissertation representing an original and significant contribution deemed worthy of publication in a recognized scientific or engineering journal.

Admission to Program

Students entering the doctoral program with a Bachelor's degree must meet the entrance requirements for the Master's program in the appropriate area of concentration. Students entering at the Master's level for the Ph.D. in Electrical Engineering program are normally expected to have a Master's in Electrical Engineering. Generally, admission to these Ph.D. programs is conditional on a student achieving a 3.5 grade point average in prior BS and MS programs. GRE is required for all applicants.

Thesis Advisor and Academic Advisor

Many factors enter into a student's choice of an advisor for his/her research. In addition to the scientific, intellectual and personality factors which influence the pairing of student and professor, financial aspects must also be considered. For most full-time students, the ideal situation is to find an advisor who has a research topic of mutual interest, as well as funds available from research grants and contracts which can support the student as a Research Assistant (RA). A prospective student is encouraged to contact faculty members in his/her research area regarding the possibility of advising before applying to the Ph.D. program. A student who joins the Ph.D. program without securing a thesis advisor will be assigned an academic advisor, who will guide the student in terms of course selection and research activities before the qualifying exam. A Ph.D. student candidate must obtain the commitment of a faculty member in the student's chosen area of major research interest to be the student's thesis advisor before taking the qualifying exam.

Usually, the thesis advisor is a full-time faculty member in the Electrical and Computer Engineering Department and as such is considered chair of the student's Guidance Committee. If a student wishes to have someone outside the ECE department to serve as his/her advisor, the student should submit the CV of the person and a letter of commitment from the person to serve as the advisor to the Ph.D. EE Program Director for approval. The thesis advisor must have a Ph.D. degree in the student's proposed area of research.

Qualifying Examination

A Ph.D. student (referred to as the student below) must pass the Ph.D. qualifying examination before the deadline to continue in the Ph.D. program and register for Ph.D. Dissertation Credits (ECE-GY 999x). The exam is an oral exam with content described below, but the student must have completed certain course and project requirements before taking the oral exam. Results of the exam will be recorded in the student's transcript as RE-GY 9990.Detailed information about the requirements to be satisfied before taking the qualifying exam including both course requirement, project scope and application process can be found in ECE graduate student manual, available under the ECE department webpage. Results of the exam will be recorded in the student's transcript as RE-GY 9990.

A. Requirements to be satisfied before taking the oral exam

1) The student must have registered at NYU-Tandon for at least one semester and taken at least 3 graduate-level courses and the student's cumulative GPA from formal courses (not including MS thesis, independent projects and readings) should be 3.5 or above.
2) The student must have completed at least 2 core courses (See Section on Course Requirement), with GPA over the core courses being 3.5 or above, and each core course earning a grade of B or above.
3) The student must have completed a research project under the supervision of a project advisor. The advisor can be any faculty member associated with ECE department. Notice that an external researcher may serve in this role, subject to approval by the chair of the ECE Graduate Curriculum and Standards Committee (to be referred to as the Graduate Committee subsequently). Examples of the project include, but are not limited to, an in-depth literature review of a certain topic, demonstrating solid understanding of a certain set of papers, or implementation and validation of some algorithms in past literature, or a study based on ideas initiated by the advisor or the student. Publication is not a requirement, but is encouraged if the student and the advisor find the contributions by the student worthy of publication. The project advisor should ensure that the project topic is appropriate for evaluating the student's potential for Ph.D. research. It is the student's responsibility to identify and secure a project advisor.
4) The student should have secured an ECE faculty member (or an external member approved by the Chair of the Graduate Committee) prior to taking the qualify exam, who will serve as the student's Ph.D. advisor if the student passes the oral exam. The project advisor does not have to be the Ph.D. advisor. The prospective Ph.D. advisor is not obligated to provide financial support for the candidate. The advisor's letter of support must state a commitment of advising should the student pass the exam. It may also contain a narrative summarizing student's progress in the program.

B. Oral exam

1) The oral exam committee should include the prospective Ph.D. advisor, and three other faculty members chosen by the student in consultation with the Ph.D. advisor. The committee should have at least three Tandon ECE tenure or tenure track (T/TT) faculty (including advisor), the fourth one can be a faculty member or an industry/research professor (with Ph.D. in ECE. or a related area) from NYUAD, NYUSH, or any other NYU department. At most one member can attend the exam remotely if the member is at NYUAD or NYUSH. The student is responsible to secure the committee members to attend the oral exam and identify a time at which all committee members can attend. The exam should be scheduled for 1.5 hours to allow sufficient time for questions and answers and final discussion among the committee members. Once the schedule is fixed, the advisor should announce the exam to all ECE faculty and invite them to attend the exam.
2) A student must send in an official application, along with other required material, for taking the oral exam to the Ph.D. EE qualifying exam coordinator, at least two weeks before the target date of the oral exam. The application form can be downloaded from: http://engineering.nyu.edu/academics/departments/electrical/students/student-resources. The student must be registered for RE-GY 9990 at the time of the application. This zero-credit course is used for recording the exam results and follows the standard add/drop deadlines. A permission code for RE-GY should be requested from Prof. XK Chen with a copy to the student's advisor.

3) The student must submit a written project report to the exam committee at least one week before the exam date. The written report should be self-contained, and follows the standard format of a conference paper. It is recommended that the report size is between 4 - 6 pages in double column, font size 11.
4) During the exam, the student should give a 30-minute project presentation, followed by questions from the committee members, which should cover both the topic areas of the project and the foundational knowledge in the student's chosen research area. Each committee member (excluding the advisor) is expected to engage in about 15 minutes of questions and answers with the student, with a total of 45 minutes for questions and answers. The student may ask each committee member about from which area will the faculty member ask fundamental questions, although the faculty member is not obliged to provide a detailed answer.
5) The committee will provide a written evaluation of the student's potential for Ph.D. research to the department. The committee members can seek input from the prospective Ph.D. advisor when making such evaluation, but the advisor is excluded from participating in voting and writing the evaluation report. The evaluation criteria can be found from the evaluation form posted here: http://engineering.nyu.edu/academics/departments/electrical/student-resources
6) The ECE department will make the final decision of pass or fail based on the exam committee's recommendation. If the student and advisor intent is to take the dissertation credits ECE-GY 999X during the same term as the RE-GY 9990 qualifying exam, the exam committee's recommendation must reach the PhD qualifying exam coordinator at least a week in advance of the add/drop deadline for that term.
7) Result (Pass or fail) of the qualifying exam (RE9990) will be recorded in the student's transcript.
8) The student should prepare the report and the presentation independently, without the help from his/her advisor.
9) If a student wants to present a work described in a published, accepted or submitted paper of which the student is not the sole author, the student should submit a short report (2 pages) that is an extensive summary of the work, or a literature survey of the area, and his/her future work, written by the student only, to be submitted along with the paper.
10) The student can present a work that has been presented at a conference, but the presentation should be modified as necessary to fit the qualifying exam oral presentation time limit and provide sufficient background material. The modification should be done by the student independently, without the help of the advisor.

C. Time Limit and Timelines of the First and Repeat Oral Exams

1) Qualifying Exam Limit: It is important to note that students must pass the qualifying exam within 2 years of starting the PhD program or they can be dismissed from the PhD program. The 2 years is "academic years," i.e., fall/spring, fall/spring. In other words, the summer after the 2nd year is not included.
2) First Exam: For students (both full-time and part-time) who started the Ph.D. program with prior MS degree in electrical engineering or a related area, the first oral exam should be taken no later than one year after starting in the Ph.D. program. For students (both full-time and part-time) who started the Ph.D. program without a prior MS degree, the first oral exam can be taken either in the first year or the second year but the max of 2 years to pass the qualify still applies. If a student does not meet the requirement for taking the exam by this deadline, the student might be disqualified from the program.
3) Repeat Oral Exam and Disqualification: Students who failed the first oral exam but otherwise successfully meet the requirement for taking the oral exam can repeat the exam at most once, which should be completed within one year after the first exam. Students who fail to pass the repeat exam will be disqualified from the program.
4) Scheduling of First Exam and Repeat Exam: The first or repeat oral exam should be scheduled before a semester starts so that the student will be informed of the exam result on time for his or her course planning. A student who needs to repeat the qualify exam cannot repeat the exam in the same semester and must wait at least three months from the time when the first exam was taken.
5) More on the Repeat Exam: When a student is found to be deficient only in one part of the exam (e.g. written report, presentation of the project, answering fundamental questions), the student may be asked to repeat just that part of the exam. The repeat of a portion of the exam is treated the same as the repeat of the qualifying exam and is subject to the same deadline.

Course Requirements

1) Core Courses: A student, in consultation with and upon approval by the Ph.D. advisor, should choose at least 4 ECE-GY courses (12 credits) among courses with numbers ECE-GY6xxx, ECE-GY7xxx, ECE-GY8xxx, as their core courses. Transferred courses cannot be used to satisfy the core course requirement. To graduate, each course must have

a grade of B or above and the average grade of the four courses must be 3.5 or above. The student must have completed at least 2 such courses with the average grade of taken courses being 3.5 or above, before taking the oral qualifying exam. The remaining core courses must be completed before graduation. The list of core courses a student (with a prior MS degree) will register for must be approved by his or her Ph.D. advisor.
2) ECE-GY courses: A student must choose at least 24 credits of ECE-GY courses, including the core courses. This requirement can be satisfied by the 30 credits transferred from a prior MS degree in electrical engineering or computer engineering.
3) Non-ECE Courses: A student must choose at least 2 non-ECE graduate-level courses (6 credits or more) that are in either Science or Engineering discipline. These courses should be chosen from areas that are distinct and yet consonant with the student's research area. Please note the courses in management cannot be counted towards this requirement. Courses taken at other schools of NYU will be counted towards this requirement provided that the PhD advisor approves them. Transferred courses taken at other accredited graduate programs are subject to approval by the Ph.D. EE program director.
4) Other courses: The degree requires a total of 75 credits with at least 21 Ph.D. dissertation credits taken at Tandon. A student must take a minimum of 42 credits in formal courses (as distinct from "independent study" credits such as reading, project or thesis), with a minimum of 24 course credits in ECE-GY courses. The student has freedom in choosing courses, provided that he or she satisfies the requirements specified in 1), 2) and 3). The student should consult with his/her Ph.D. advisor or academic advisor in devising a course plan as early as possible so that the course work covers sufficient depth for the student's chosen area of research and related field, as well as sufficient breadth. Note that credits from CS5000-level courses cannot be counted towards Ph.D. EE degree.
5) GPA requirement: As with all the graduate programs at NYU-Tandon, a student must maintain a GPA of 3.0 or above among all courses taken at NYU. A student with GPA below 3.0 has up to two semesters on probation. If at the end of the second semester on probation, the GPA is still below 3.0, the student will be disqualified from the program. The Ph.D. EE program further requires that a student must have a GPA of 3.5 or above among all formal courses (not including dissertation or other independent studies) taken at NYU to graduate, in addition to the GPA requirement for the core courses as specified in Item 1).
6) Internships: International students must register for an internship course to do an internship. Up to 6 credits of approved internships for Ph.D. (CP-GY 9941, CP-GY 9951, CP-GY 9961, CP-GY 9971, 1.5 credits each) can be applied towards the 75 credits Ph.D. degree requirement, and in particular, the ECE-GY course requirement as specified in Item 2) above. These credits can be part of the 45 credits beyond the 30 credits of a prior MS degree, which may include up to 3 credits of approved internships for MS (CP-GY 9911, CP-GY 9921). For an internship to be approved for credits, the internship must provide training relevant to the student's research area. All internship must be approved and supervised by the student's Ph.D. advisor. The internship supervisor should submit a midterm and a final term evaluation report to the Ph.D. advisor. The student must submit a project report to the advisor upon completion of the internship for the evaluation and grading of the internship course.

Transfer Credits

For Ph.D. students with a prior MS degree, they are allowed to transfer up to 36 credits, of which 30 credits must be from their prior MS degree in ECE or a closely related field. For Ph.D. students admitted without a prior MS degree, they can transfer at most 6 credits. For the blanket transfer of 30 credits from a prior MS degree in ECE or a closely related field toward the PhD degree in EE, the student must provide a copy of his or her prior MS degree and the official academic transcripts. For individual course transfer, the student must provide an official transcript in a sealed envelope as well as catalog descriptions of the courses to be transferred, for evaluation and approval by the department graduate advisor. The official transcript and/or diploma submitted during the student's admission process can be used in place of new submission. Graduate courses taken at other schools of NYU or taken as an undergraduate student at NYU Tandon School of Engineering are exempt from this policy, but are subject to the general polity of the Tandon School of Engineering regarding such courses. This policy is effective for students entering in Spring 2018 and later.

Guidance Committee

On passing the qualifying examination, the student should consult with his or her thesis advisor to identify additional members and form a guidance committee. The committee should be composed of at least three members with the thesis advisor usually acting as Chairperson. If the dissertation advisor is not a tenured or tenure track (T/TT) Tandon faculty member of the Department, then a T/TT Tandon faculty member of the Department in the student's research area must be invited to serve as the Committee Chair. The committee should include at least two ECE T/TT faculty (including the advisor, and the NYUAD and NYUSH T/TT faculty), and may include at most two external members from outside the Department who are in the student's area of major research interest. The student must submit the names of the members of his or her Guidance Committee to the Office of Graduate Studies with a copy to the ECE Graduate Office within 6 months of passing the qualifying exam. The Guidance Committee conducts the area examination and thesis defense, and approves the final thesis. The Guidance Committee appointment form can be obtained from the Office of Graduate Studies.

Area Examination

In the area exam, the student reviews the prior research in the student's chosen dissertation topic and presents preliminary research results and additional research plan. The area exam is conducted by the Guidance Committee, but may be open to other interested faculty and students. The Guidance Committee attends and evaluates the student's performance and determines whether the student demonstrates the depth of knowledge and understanding necessary to carry out research in the chosen area. Results of the exam will be recorded in the student's transcript as ECE-GY 9980.

The student must submit a written report that summarizes prior research and the future plan at least one week before the scheduled exam time. The report should follow the Ph.D. dissertation template and be at least 25 pages long. The student must take and pass the area exam within 2 years after passing the Ph.D. qualifying exam. Students who fail to pass the exam by the deadline will be disqualified from the program.

The area exam evaluation form provides further details on the evaluation criterion for passing, and can be downloaded from: http://engineering.nyu.edu/academics/departments/electrical/student-resources

Registration for Ph.D. Dissertation Credits

After passing the qualifying exams, and with the agreement of the Thesis Advisor, the Ph.D. candidate may begin registration for dissertation credits ECE-GY 999x. (The student's failure to abide by this rule may result in loss of credit for the dissertation registration.) A student must register at least 3 credits for ECE-GY999x each semester. A minimum of 21 credits is required for the Ph.D. degree. The student must register for thesis continuously, every Fall and Spring semester, unless a Leave of Absence has been granted by the Office of Graduate Studies.

Submission of the Thesis and Thesis Defense

Upon completion of the doctoral dissertation, the candidate undergoes an oral thesis defense. The defense is conducted by the Guidance Committee, but is open to all members of the ECE faculty and other invited people. The student must submit a complete draft of the dissertation to the Guidance Committee members at least one week before the scheduled defense. The student should consult the Office of Graduate Studies regarding how to submit, reproduce and bind the final manuscript.

Seminar Attendance Requirement

Ph.D. students are required to register for a 0-credit Research Seminar course (ECE-GY 9900) for at least 4 semesters. Satisfactory grade is given only if the student attends more than 2/3 of the seminars offered in a semester. Part-time students who have difficulty attending the seminar because of work conflict may be exempted from this requirement upon approval of the Ph.D. EE program director. The student should submit the approval note when applying for graduation.

Publication Requirement

To be granted the Ph.D. degree, a Ph.D. candidate must either have a peer-reviewed journal paper (accepted or published), or have at least one paper under review by a peer-reviewed journal on the thesis research subject.

For the journal paper(s), a letter of acceptance by a journal, or a letter of submission to a peer-reviewed journal along with acknowledgment of its receipt by the journal, will constitute the required evidence. If there is no accepted/published journal paper, the student should have at least one accepted conference paper that appeared in the proceedings of a peer-reviewed conference.

Requirements for Students Entered Before Fall 2014

Students who entered before Fall 2014 can either follow the requirements described above, or the requirement effective at the time of matriculation. The requirements posted in the NYU-Tandon catalog as of Sept. 2013 differ from the new requirements in the following aspects. For a complete description, please consult the ECE Graduate Student Manual published in Spring 2013.

Course and Thesis Requirements: A minimum of 75 credits of academic work beyond the bachelor's degree, including a minimum of 21 credits of NYU-Tandon dissertation research, is required. A minimum of 42 credits in formal courses (as distinct from independent study credits such as reading, project or thesis) are required. A student entering with a MS from a reputable graduate program may transfer 30 credits. PhD students are required to take a minimum of 9 credits of courses in a minor area outside of electrical engineering. The minor must be taken in an area that is both distinct from and yet consonant with the student's major study area. Students work with thesis advisers to develop their major study program. The major program should constitute a coherent, in-depth study of the most advanced knowledge in the student's area of concentration.

Publication Requirement: To be granted the PhD degree, a PhD candidate must have at least one accepted or submitted journal paper on the thesis-research subject.

Transfer credits: For Ph.D. students entered before Spring 2015, the following policy as stated in the NYU-Tandon catalog as of Sept. 2013 are applicable: Doctoral candidates may transfer a maximum of 48 credits, including a 30-credit blanket transfer from a prior MS degree in Electrical Engineering or a closely related field, and additional courses in Science and Engineering not included in the prior MS that are individually transferred. For the blanket 30-credit transfer, the prior MS need not be a 30-credit MS, so long as an MS degree (or equivalent) was granted, and a copy of the degree and detailed transcripts are presented. Additional courses individually transferred cannot include project, thesis, dissertation, guided studies or readings, or special topics credits. Applications for transfer credits must be submitted for consideration before the end of the first semester of matriculation. The student's major academic department evaluates graduate transfer credits, but no courses with grades less than B will be considered.

PhD Time Limits: The PhD time clock begins at the time of enrollment in the PhD program. Full-time PhD students who have completed an MS degree or who transfer 24 or more graduate credits towards their PhD degree must complete their PhD degree requirements within six years from the beginning of their PhD studies. Full-time PhD students who transfer in or have completed fewer than 24 credits when they begin their PhD studies have a maximum of seven years to complete their PhD. Part-time PhD students must complete their PhD degree requirements within nine years from the beginning of their PhD studies. Approved leave of absence will stop the time clock.

Graduate Manual:

For further information, please refer to the graduate manual, which can be found on the student resources page: https://engineering.nyu.edu/academics/departments/electrical-and-computer-engineering/student-resources

Department of Finance and Risk Engineering

Peter Paul Carr: Department Chair
Barry Blecherman: Deputy Department Chair

Mission

The mission of the Department of Finance and Risk Engineering is to create world-class research and educational programs that provide students with superior training and skills that bridge theory and practice in today's cutting-edge financial services industry and its many associated professions.

The Department

The Department of Finance and Risk Engineering (FRE) is a diversified research and degree granting department - the largest of its kind in the U.S. with approximately 300 students and the largest alumni base in the world. The Department provides a multi-faceted education through the MS in Financial Engineering program and an undergraduate Minor in Finance.

Our program is recognized as being at the forefront of research in the financial field with faculty from around the world who are highly ranked by the significance of their contributions. The department is staffed by a number of leading academics and practitioners, and boasts a number of outstanding affiliated professors and cutting-edge traders, hedge fund managers and academics turned practitioners by the lure of Wall Street. This combination of talent, theoretically and practically-based, national and international, generates first-rate research and provides a first-rate education embedded in answering the real needs of the financial services sector.

The department's educational and MS degree-granting programs, research and extracurricular activities seek to bridge theory and practice and meet the many complex challenges confronting financial engineering professions. The department's curriculum combines a rigorous vision of economics, finance, applied quant finance, and financial technology in their theoretical and practical setting in a global world and global financial markets. In addition, the department provides interdisciplinary opportunities combining computer science, mathematics, and engineering with financial management and technology and financial and risk engineering.

Graduates have taken their places in a diverse set of positions in the financial engineering. Trading desks, hedge fund and investment professionals, CFOs, quantitative professionals, insurance experts, financial technology professionals, as well as financial and specialized risk managers define the broad set of professions that are open to NYU Tandon School of Engineering's graduates in financial engineering. The department regularly adapts and updates the program to reflect the changing industry, giving students the necessary competitive edge in the job market. Top employers regularly recruit our graduates for the superior training they have to lead at the forefront of the field.

Students have opportunities to acquire new insights and build practical solutions to the emerging challenges in the ever-changing world of finance through local and global industry collaborations.

The Profession

Financial engineering is driven by financial practice to bridge means and ends and to reconcile the theoretical foundations of financial economics with the reality of financial markets. Finance is about money and therefore, all problems that can be transformed to a real or to a synthetic monetary framework can profit by the application of financial engineering thought. In this spirit, our goal and objectives pertain to trading, speculating, investing, pricing and risk management but also to pricing and managing the risks of infrastructure, the environment, and business management. We meet the challenges of financial markets in analysis, pricing, trading and investing for technology managers and computational finance engineers in fast-moving, highly rewarding careers that create value enabled by finance, technology and computational mathematics.

Contact

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Tel: 646.997.3279
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Web: http://engineering.nyu.edu/academics/departments/finance

Degrees Offered

Master of Science

- Financial Engineering, M.S.

Undergraduate Minor

- Finance Minor

Faculty

Peter Paul Carr

Department Chair and Professor

Charles S. Tapiero

Topfer Distinguished Professor of Financial Engineering

Nassim Nicholas Taleb

Distinguished Professor of Risk Engineering

Barry Blecherman

Deputy Department Chair and Industry Professor

David Shimko

Industry Professor

Agnes Tourin

Industry Associate Professor

Adjunct Faculty

James Adams

Sassan Alizadeh

Andrew Arnold

Kevin Atteson

Ernest Baver

Jerome Benveniste

Raphaele Chappe

Maggie Copeland

Kosrow Dehnad

Sebastien Donadio

Serge Feldman

Roy Freedman

Roza Galeeva

Dan Gode

Samim Ghamami

Michael Hayes

Jon Hill

Andrey Itkin

Mirela Ivan

Sandeep Jain

Rajesh Krishnamachari

Ashish Kohli

Vikram Kuriyan

Sudeep Lahiri

Norris Larrymore

Brian R. Lessing

Mike Lipkin

Victor Makarov

Naresh Malhotra

Edith Mandel

Steve Mandel

Sateesh Mane

Ingrid Marshall

Asha Matthei

Warren Matthei

Attilio Meucci

Ali Nazari

Papa Ndiaye

Unurjargal Nyambuu

Tore Opsahl

Jerzy Pawlowski

Ken Perry

Thomas Philips

Meninder Singh Purewal

David Rios

Gordon Ritter

Dan Rodriguez

Anatoly Schmidt

Louis Scott

Frederic Siboulet

Ronald T. Slivka

Michael Sotiropoulos

Song Tang

Leon Tatevossian

Daniel Totouom-Tangho

Ashu Tripathi

George Varughese

Tyler Ward

Ed Weinberger

Ken Winston

Jason Yarmish

Ken Zhang

Jianghong (Jane) Zhao

Financial Engineering

Program Director: Charles Tapiero
Program Co-Director: Barry Blecherman

Master's in Financial Engineering

Financial engineering seeks to bridge theoretical finance and its practice. This concept underpins the NYU Tandon MS program in financial engineering. The goals and objectives of the program are to train and prepare our students for fast-moving and highly rewarding careers that create value enabled by finance, technology, computational finance and engineering risk finance. Careers and employment opportunities include trading, investments, financial risk management, pricing as well as corporate financial positions in a broad array of firms such as financial services, insurance, industrial and business firms.

To these ends, the Department of Finance and Risk Engineering offers in its MS in Financial Engineering Program a wide range of graduate-level courses including: Quantitative Finance, Economics, Financial Markets and Corporate Finance, Financial Econometrics, Behavioral Finance, Credit Risk and Credit Derivatives, Financial Insurance, High Frequency Trading, Agent-Based Modeling, Financial Technology, Risk Management, Risk Analysis and Assessment in Financial Services, Financial Regulation, Stochastic Finance Calculus and Stochastic Financial Modeling. Both financial and economic theories are then applied to the complex problems financial engineers confront including: Fixed Income, Derivatives, Credit Risk and Credit Derivatives and Securitization. In addition, the department offers a wide range of financial labs and Bloomberg assisted classes, topical and advanced courses including: Financial Analytics, Private Equity, Incomplete Markets Finance, Market Microstructure, and Electronic Trading.

These courses form a major portion of the course work for an advanced degree in financial engineering and bridge the gap between theoretical and applied finance. A limited number of courses may also be taken by students outside of FRE (subject to approval by the Finance and Risk Engineering Department) to satisfy elective requirements.

The department has a Research Institute that emphasizes specialized research areas and provides research opportunities to students. These include:

- Research on personal finance and investments, the finance of rare and uncommon risks, financial regulation, real finance and business policy, alternatives finance as well as topical projects pursued by students and faculty.
- Research that emphasizes trading platforms and software development and the management of financial technology as well as related topics. The Institute is a research hub and laboratory for generating new industry ideas and tools. It also undertakes collaborative research projects to provide ideas, methods and tools with scholarly and practical applications.

Undergraduates in Graduate FRE Courses

The Department of Finance and Risk Engineering does not permit undergraduates to take courses with the prefix "FRE"; these are graduate courses reserved for graduate students. Exceptions are made only for sub-matriculated undergraduates; undergraduates who have applied to and been accepted to the MS FE program at NYU Tandon in their senior year of undergraduate studies or as part of the BS/MS Program. No other exceptions are made.

Non-Degree

Finance Minor

The Department of Finance and Risk Engineering offers an Undergraduate Minor in Finance. The intent of this program of study is to allow NYU Tandon School of Engineering undergraduate students in the sciences and engineering to leverage their mathematical talents in a selected number of appropriate courses. This cross-school minor is also open to other NYU students with sufficient mathematic preparedness.

For more information on the Finance Minor, visit:

http://engineering.nyu.edu/academics/departments/finance/minor

You may apply for a minor, or any minor, in Albert in the My Academics section of the Student Center.

Contact Information:

Departmental Adviser: Professor Barry Blecherman

bsb279@nyu.edu

Master of Science

Financial Engineering, M.S.

The Master of Science Program

The Master of Science in Financial Engineering (FE) is a 33-credit program designed to provide students with the skills required to operate at the cutting-edge of financial engineering in today's financial services industry. The program is rigorous, demanding and selective. The MS in Financial Engineering is a well-established program with a diverse curriculum. Our faculty are recognized leaders in their fields, all with extensive practical expertise. They produce world-class research while teaching both introductory and advanced courses in small class settings. The financial and practical components of the educational program have been further strengthened by developing a large and versatile body of adjunct faculty consisting of leading financial market practitioners from major Wall Street firms as well as international affiliated faculty. These adjunct faculty members work closely with full-time faculty emphasizing both applied and theoretical research in bringing to financial engineering students a greater sensitivity to the needs and the demands of financial markets and the management of financial services and institutions.

Required to Complete the Financial Engineering MS program

- Two pre-program boot camp courses (0 credits)
- Self-paced course in the use of Bloomberg Terminals (0 credits)
- Core courses (15 credits):
    - Required courses:
        - FRE-GY 6073 Introduction to Derivative Securities (3 credits)
        - FRE-GY 6083 Quantitative Methods in Finance (3 credits)
        - FRE-GY 6103 Valuation for Financial Engineering (3 credits)
    - Two of the following three courses:
        - FRE-GY 6023 Financial Economics (3 credits)
        - FRE-GY 6123 Financial Risk Management (3 credits)
        - FRE-GY 7773 Machine Learning in Financial Engineering (3 credits)
- Elective coursework (13.5 credits)
- Laboratory learning (1.5 credits)
- Capstone (3 credits)
- Capstone assessment course (0 credits)
- **Total # of credits: 33**

The program prepares its graduates to enter fast-moving, highly rewarding careers spanning the many occupations prevalent in financial services and related industries. The educational program is continuously updated and adapted to the changing financial environment.

Admissions

The Department receives a large number of applications every year. To be considered for admission into the MS in Financial Engineering program, students must have a Bachelor's Degree from an accredited institution and proven mathematical mastery of the following topics:

- Linear Algebra
- Probability Theory
- Multi-variable Calculus
- Applied Statistics
- Computer Programming

Applicants must submit official transcripts from each institution attended as well as GRE test scores. When applicable, applicants must also prove English language proficiency demonstrated by a TOEFL or IELTS score.

The FRE department does not accept change-of- major requests from students in other NYU programs. In all instances, students must formally apply to this MS FE program. Applicants must have demonstrated proficiency in the mathematical areas listed to be considered for admission.

For questions about the application process, application status or to talk to an admissions counselor, please contact:

Office of Graduate Enrollment Management and Admissions

NYU Tandon School of Engineering
Six MetroTech Center
Brooklyn, NY 11201
engineering.gradinfo@nyu.edu
Phone: 646.997.3182
Fax: 646.997.3624

Department of Mathematics

Chair: Bruce Kleiner

Mission Statement

The undergraduate division of the Department of Mathematics offers a wide variety of courses in pure and applied mathematics taught by a distinguished faculty with a tradition of excellence in teaching and research. Most of the faculty is associated with the University's Courant Institute of Mathematical Sciences, noted for its advanced training and research programs.

The Department

The department offers BS and MS degrees in Mathematics, as well as a BS degree with a dual major in Mathematics and Physics. Both degrees provide a student with a solid basis for future studies in mathematics or careers that require mathematical skills.

Degrees Offered by the Mathematics Program

Bachelor of Science

- Mathematics, B.S.
- Physics and Mathematics, B.S. (with the Department of Applied Physics)

Master of Science

- Mathematics, Examination Option, M.S.
- Mathematics, Thesis Option, M.S.

Contact

Department of Mathematics
NYU Tandon School of Engineering
2 MetroTech Center, 865
Brooklyn, NY 11201
Tel: (646) 997-3850
Web: math.nyu.edu/tandon

Department Heads

DIRECTOR, COURANT INSTITUTE OF MATHEMATICAL SCIENCES

Professor Russel Caflisch

CHAIR OF THE DEPARTMENT

Professor Bruce Kleiner

DIRECTOR OF UNDERGRADUATE STUDIES

Professor Oliver Buhler

VICE-CHAIR FOR UNDERGRADUATE AFFAIRS AT CAS

Professor Matthew Leingang

VICE-CHAIR FOR UNDERGRADUATE AFFAIRS AT TANDON

Professor Elizabeth Stepp

Faculty

Armstrong, Scott	Associate Professor of Mathematics Partial differential equations, probability theory, and stochastic homogenization
Avellaneda, Marco	Professor of Mathematics Applied mathematics, mathematical modeling in finance, probability
Bakhtin, Yuri	Associate Professor of Mathematics Random dynamics, probabilistic models of mathematical physics
Bandeira, Afonso S.	Assistant Professor of Mathematics Applied mathematics, optimization, probability, information theory, signal processing, mathematics of data science
Ben Arous, Gérard	Professor of Mathematics Probability theory, stochastic processes, partial differential equations
Berger, Marsha	Silver Professor of Computer Science and Mathematics

	Computational fluid dynamics, adaptive methods for partial differential equations, parallel computing
Bogomolov, Fedor	Silver Professor of Mathematics Algebraic geometry and related problems in algebra, topology, number theory
Bourgade, Paul	Associate Professor of Mathematics Probability, random matrices, statistical physics and stochastic processes
Bühler, Oliver	Professor of Mathematics and Atmosphere/Ocean Science Geophysical fluid dynamics, interactions between waves and vortices, acoustics, statistical mechanics
Caflisch, Russel	Professor of Mathematics; Director, Courant Institute Applied math, PDEs, fluid dynamics, plasma physics, materials science, Monte Carlo methods, computational finance
Cappell, Sylvain E.	Silver Professor of Mathematics Algebraic and geometric topology, symplectic and algebraic geometry
Cerfon, Antoine	Assistant Professor of Mathematics Magnetohydrodynamics in fusion and astrophysical plasmas, nonneutral plasmas, kinetic theory in plasmas and rarefied gases
Cheeger, Jeff	Silver Professor of Mathematics Differential geometry and its connections to analysis and topology
Chen, Yu	Associate Professor of Mathematics Numerical scattering theory, ill-posed problems, scientific computing
Deift, Percy A.	Silver Professor of Mathematics Spectral theory and inverse spectral theory, integrable systems, Riemann-Hilbert problems
Donev, Aleksandar	Associate Professor of Mathematics

	Multi-scale (hybrid) methods; fluctuating hydrodynamics; coarse-grained particle methods; jamming and packing
Fernandez-Granda, Carlos	Assistant Professor of Mathematics
Galichon, Alfred	Professor of Economics and Mathematics Optimal transport, mathematical finance, economic equilibrium
Gerber, Edwin	Associate Professor of Mathematics and Atmosphere/Ocean Science Atmospheric dynamics, climate variability, stochastic modeling
Germain, Pierre	Professor of Mathematics Nonlinear partial differential equations, harmonic analysis
Giannakis, Dimitris	Assistant Professor of Mathematics Atmosphere ocean science, geometric data analysis, uncertainty quantification
Goodman, Jonathan B.	Professor of Mathematics Fluid dynamics, computational physics, computational finance
Greengard, Leslie	Silver Professor of Mathematics and Computer Science Applied and computational math, partial differential equations, computational chemistry, mathematical biology
Gromov, Mikhael	Jay Gould Professor of Mathematics Riemannian manifolds, symplectic manifolds, infinite groups, math models of biomolecular systems
Gunturk, C. Sinan	Professor of Mathematics Harmonic analysis, information theory, signal processing
Hang, Fengbo	Associate Professor of Mathematics Geometric analysis
Holland, David	Professor of Mathematics and Atmosphere/Ocean Science Ocean-ice studies, climate theory and modeling

Holmes-Cerfon, Miranda	Assistant Professor of Mathematics Materials science, statistical mechanics, stochastic methods, computational geometry
Kleeman, Richard	Professor of Mathematics and Atmosphere/Ocean Science Climate dynamics, El Nino, predictability of weather and climate dynamical systems
Kleiner, Bruce	Professor of Mathematics Geometric analysis, geometric group theory and geometric evolution equations
Kohn, Robert V.	Silver Professor of Mathematics Nonlinear partial differential equations, materials science, mathematical finance
Lin, Fang-Hua	Silver Professor of Mathematics Partial differential equations, geometric measure theory
Lubetzky, Eyal	Professor of Mathematics Probability theory and combinatorics
Lutwak, Erwin	Professor of Mathematics; Deputy Chair for Tandon Convex geometry, geometric and analytic inequalities
Majda, Andrew J.	Professor of Mathematics and The Samuel F. B. Morse Professor of Arts and Science Modern applied mathematics, atmosphere/ocean science, partial differential equations
Masmoudi, Nader	Professor of Mathematics Nonlinear parallel differential equations
McKean, Henry P.	Silver Professor of Mathematics Probability, partial differential equations, complex function theory
McLaughlin, David W.	Silver Professor of Mathematics and Neural Science Applied mathematics, nonlinear wave equations, visual neural science
Miller, Edward	Professor of Mathematics

	Differential topology
Mishra, Bhubaneswar	Professor of Computer Science and Mathematics Robotics, genomics, finance, mathematical and theoretical computer science
Mogilner, Alex	Professor of Mathematics and Biology Computational Biology, Cell Biophysics and Mathematical Biology
Newman, Charles M.	Silver Professor of Mathematics Probability theory, statistical physics, stochastic models
O'Neil, Mike	Assistant Professor of Mathematics (joint appointment with NYU Tandon) Electromagnetics, acoustics, fluid dynamics, fast algorithms, integral equations and computational statistics
Overton, Michael	Silver Professor of Computer Science and Mathematics Numerical linear algebra, optimization, linear and semi-definite programming
Pauluis, Olivier	Professor of Mathematics and Atmosphere/Ocean Science Climate and the general circulation of the atmosphere, moist convection, tropical meteorology, numerical modeling
Percus, Jerome K.	Professor of Mathematics and Physics Chemical physics, mathematical biology
Peskin, Charles S.	Silver Professor of Mathematics and Neural Science Applications of mathematics and computing to problems in medicine and biology, cardiac fluid dynamics, molecular machinery within biological cells, mathematical/computational neuroscience
Pirutka, Alena	Associate Professor of Mathematics Arithmetic and algebraic geometry, number theory
Rangan, Aaditya	Associate Professor of Mathematics Computational biology, numerical analysis
Rinzel, John	Professor of Neural Science and Mathematics

	Computational neuroscience, nonlinear dynamics of neurons and neural circuits, sensory processing
Ristroph, Leif	Assistant Professor of Mathematics Fluid dynamics, non-linear dynamics, experimental physics, biophysics, and geophysics
Serfaty, Sylvia	Silver Professor of Mathematics Nonlinear Partial Differential Equations, Ginzburg-Landau equations, and variational problems from material science
Shatah, Jalal M. I.	Professor of Mathematics Partial differential equations, analysis
Shelley, Michael J.	Professor of Mathematics, Neural Science, and Mechanical Engineering, and the Lilian and George Lyttle Professor of Applied Mathematics Applied math and modeling, visual neuroscience, fluid dynamics, computational physics and neuroscience
Smith, K. Shafer	Associate Professor of Mathematics and Atmosphere/Ocean Science Geophysical fluid dynamics, physical oceanography and climate
Spencer, Joel H.	Silver Professor of Mathematics and Computer Science Discrete mathematics, theoretical computer science.
Sreenivasan, Katepalli R.	Professor of Physics and Mathematics; Executive Vice Provost for Engineering and Applied Sciences, NYU Turbulence, complex fluids, cryogenic helium and nonlinear dynamics
Stadler, Georg	Associate Professor of Mathematics Parallel scientific computing, inverse problems, PDE-constrained optimization, variational inequalities, computational earth sciences
Stein, Daniel	Professor of Mathematics and Physics Theoretical condensed matter physics, statistical mechanics, and mathematical physics
Tabak, Esteban G.	Professor of Mathematics

	Dynamics of the atmosphere and ocean, energy transfer in systems with many degrees of freedom
Tranchina, Daniel A.	Professor of Biology, Mathematics, and Neural Science Mathematical modeling in neuroscience
Trefethen, Nick	Global Distinguished Professor of Mathematics and Computer Science
Tschinkel, Yuri	Professor of Mathematics Algebraic geometry, number theory, automorphic forms
Vanden-Eijnden, Eric	Professor of Mathematics Stochastic partial differential equations, statistical mechanics, turbulence theory
Varadhan, S. R. Srinivasa	Professor of Mathematics and the Frank Jay Gould Professor of Science Probability theory, stochastic processes, partial differential equations
Wright, Margaret H.	Silver Professor of Computer Science and Mathematics Optimization; scientific computing; linear algebra
Yang, Deane	Professor of Mathematics Convex geometric analysis, Riemannian geometry, Partial differential equations
Yang, Yisong	Professor of Mathematics Nonlinear Partial Differential Equations, Mathematical Physics, Applied Mathematics
Young, Lai-Sang	Silver Professor of Mathematics and the Henry & Lucy Moses Professor of Science Dynamical systems and ergodic theory
Young, Robert	Associate Professor of Mathematics Geometric group theory, metric geometry, and quantitative geometry
Zeitouni, Ofer	Global Distinguished Professor of Mathematics
Zhang, Gaoyong	Professor of Mathematics Convex geometry, Geometric analysis

Zhang, Jun	Professor of Physics and Mathematics Fluid dynamics, biophysics, complex systems
Zorin, Denis	Professor of Computer Science and Mathematics Computer graphics; geometric modeling; subdivision surfaces; multiresolution surface representations; fluid and solid simulation; perceptually based methods for computer graphics

Contract Faculty

Bhat, Vindya	Clinical Assistant Professor of Mathematics Ramsey theory; combinatorics
Clarkson, Corrin	Clinical Assistant Professor of Mathematics
Hammoud, Naima	Clinical Assistant Professor of Mathematics
Kalaycioglu, Selin	Clinical Associate Professor of Mathematics Computational group theory, representation theory of finite groups, mathematics education
Kolm, Petter N.	Clinical Professor of Mathematics Data science, econometrics, financial mathematics, machine learning, market making, optimization, portfolio optimization, quantitative & systematic trading, risk management, robo advisory & investing, smart beta strategies, stochastic optimal control, transaction costs, and tax-aware investing.
Leingang, Matthew Liu, Shizhu	Clinical Professor of Mathematics Mathematics Education, Web Pedagogies, Differential Geometry Clinical Assistant Professor of Mathematics
Majmudar, Trushant	Clinical Assistant Professor of Mathematics Bio-fluid Dynamics, bio-locomotion, soft condensed matter
Manocha, Harvansh	Industry Professor of Mathematics, Courant Tandon

	Special Functions of Mathematical Physics, Lie Theory and Special Functions, Fractional calculus, Quantum Algebras and q-Functions
Medina, Luciano	Lecturer, Courant Tandon
Oveys, Hesam	Clinical Assistant Professor of Mathematics Stochastic processes, branching processes, mathematical biology, mathematical finance, and partial differential equations
Patel, Jigarkumar	Clinical Assistant Professor of Mathematics
Qian, Jinghua	Senior Lecturer, Courant Tandon; Director of Freshman Mathematics for Tandon Probability and stochastic processes, statistics, analysis
Sia, Charmaine	Clinical Assistant Professor of Mathematics Algebraic topology, homotopy theory, the theory of topological modular forms, structured ring spectra, forms of K-theory
Sondjaja, Mutiara	Clinical Assistant Professor of Mathematics Optimization; interior-point methods; operations research
Stepp, Elizabeth	Clinical Associate Professor of Mathematics Point-Set Topology; Continuum Theory
Van Wagenen, Lindsey	Senior Lecturer, Courant Tandon; Director of Sophomore Mathematics for Tandon Dynamical systems, stochastic processes, nonlinear optics
Wielaard, James	Industry Associate Professor, Courant Tandon Mathematical biology
Zhao, Fang	Lecturer, Courant Tandon; Director of Precalculus Mathematics for Tandon

Mathematics

The Department of Mathematics administers the mathematics degree program. More information can be obtained from the department website or by calling (646) 997-3850.

The Department of Mathematics offers a wide variety of courses in both pure and applied mathematics. Faculty are members of the University's Courant Institute of Mathematical Sciences, noted for its advanced training and research programs that emphasize the applications of mathematics to technology and other branches of science.

Undergraduate Programs

The undergraduate program in mathematics provides a background for advanced study or subsequent research in mathematics and training for those students who expect to end their formal education with a bachelor's degree.

For science and engineering majors, mathematics provides the theory and methods essential to understanding the mathematical aspects of their respective fields.

With these objectives, the Department of Mathematics offers courses in mathematics and, for the mathematics major, specific programs leading to the Bachelor of Science degree. Students wishing to pursue a bachelor's degree in mathematics may elect to follow either of two courses of study. Students wishing to focus their studies within mathematics or to apply mathematics to other fields may elect the program leading to a BS in Mathematics. Students wishing to incorporate extensive physics into their mathematical training may elect the program leading to a BS in Mathematics and Physics. These two programs provide basic grounding in mathematical knowledge.

An accelerated, five-year B.S. and M.S. mathematics program is offered. In addition, independent study courses are available for students with special interests.

Mathematics majors are encouraged to spend a semester studying away. Currently, mathematics courses are offered at NYU Abu Dhabi, NYU Berlin, NYU London, and NYU Shanghai.

Dual majors in Mathematics and Physics

NYU Tandon offers undergraduates a dual major in mathematics and physics, according to the general rules described in the section Degree Requirements. Specific course requirements for this 128-credit degree must be approved by advisers from both the mathematics and physics programs. The dual major allows students to gain competence in two different and substantial fields of science to such an extent that, upon earning a bachelor's degree, they may qualify for industrial positions in two distinct areas or go on to graduate studies in either of the two subjects.

Graduate Programs

Our master's program offers students who hold bachelor degrees in mathematics and related fields an opportunity to broaden their knowledge in several fields of mathematics and its applications by providing further courses at the upper-division and beginning graduate levels. The wide and varied choice of courses reflects the Courant Institute's long tradition of multidisciplinary research and education, rooted in the strong interactions between the Department of Mathematics, the Department of Computer Science, and the Center for Data Science.

The particular nature and focus of the three masters options, are discussed in detail in the pages in this site dedicated to each program.

Non-Degree

Mathematics Minor

Requirements for Students Entering Tandon Fall 2018 or later:

A student not majoring in math or math/physics can obtain a minor in mathematics by fulfilling the following requirements:

- 16 credits of MA-UY courses
- At least 8 credits of MA-UY courses must be in addition to the major's math requirements
- At least 8 of the 16 credits must be taken while enrolled at Tandon
- Minimum 2.0 minor GPA

All courses used for the Minor in Mathematics must be pre-approved by the Math Department Advisor. Courses with similar content cannot be used towards the minor.

Requirements for Students Entering Tandon Before Fall 2018:

A student not majoring in math or math/physics can obtain a minor in mathematics by fulfilling the following requirements:

- 15 credits of MA-UY courses
- At least 8 credits of MA-UY courses must be in addition to the major's math requirements
- At least 6 of the 8 credits must be taken while enrolled at Tandon
- Must take:
    - MA-UY 4613 Analysis I
    - MA-UY 4623 Analysis II
- Minimum 2.0 minor GPA

Students who entered Tandon before fall 2018 may choose to follow the new requirements listed above.

Bachelor of Science

Mathematics, B.S.

Goals and Objectives:

- Command of core areas in both pure and applied mathematics, including but not limited to real and complex analysis, linear algebra, ordinary and partial differential equations.
- Mastery of a particular applied or engineering field and how mathematics is used in that field.
- Readiness for a variety of career options following graduation, including, but not limited to graduate study in applied mathematics, engineering, medicine, as well as professional careers in consulting, business & finance, and technology.

Rationale:

The Tandon B.S. in Mathematics program is designed to provide a student with the knowledge and skills needed to both start a career in a mathematically-oriented field and adapt easily to changes in both the field and one's career directions. The program has the following components:

- A core set of required fundamental mathematics courses
- Mathematics electives
- A cohesive set of courses that focus on a particular field of engineering. The student works together with their advisor to choose these courses appropriately.

Students must complete 126 credits, as defined below, to graduate from the NYU Tandon School of Engineering with a Bachelor of Science in Mathematics. Please note that the curriculum that follows applies to students who began classes in the Fall of 2019 or later. For students who entered the NYU Tandon School of Engineering prior to that date, please review the curriculum and typical course schedule for students entering Fall 2017 - Spring 2019 or the curriculum and typical course schedule for students entering prior to Fall 2017.

The NYU Tandon School of Engineering also offers a Physics and Mathematics, B.S. which is a dual major in both subjects.

Requirements for the Bachelor of Science

Core Mathematics Requirements: 48 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits*
  or MA-UY 1324 Integrated Calculus I for Engineers *4 credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*
  or MA-UY 1424 Integrated Calculus II for Engineers *4 credits*
- MA-UY 3044 Linear Algebra *4 Credits*
  or MA-UY 3034 Applied Linear Algebra *4 credits*
  or MA-UY 3054 Honors Linear Algebra *4 credits*
- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
  or MA-UY 2514 Honors Calculus III *4 Credits*
- MA-UY 4614 Applied Analysis *4 Credits*
  or MA-UY 4644 Honors Analysis I *4 Credits*
- MA-UY 4204 Ordinary Differential Equations *4 Credits*
  or MA-UY 4214 Applied Ordinary Differential Equations *4 credits*
- MA-UY 3014 Applied Probability *4 Credits*
  or MA-UY 3514 Honors Probability *4 Credits*
- MA-UY 4414 Applied Partial Differential Equations *4 Credits*
- MA-UY 4434 Applied Complex Variables *4 Credits*
- MA-UY 4114 Applied Statistics *4 Credits*
- MA-UY 4424 Numerical Analysis *4 Credits*
- MA-UY 4444 Intro to Math Modeling *4 Credits*

Other Required Courses: 27 Credits

- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Math Electives: 8 Credits

Students should select two math elective courses totaling at least 8 credits.

Other Electives: 28 Credits

- Students are required to take 16 credits in the humanities and social sciences.

Note**:** EXPOS-UA 1 and EXPOS-UA 2 do not count toward the Humanities and Social Sciences Elective requirement of 16 credits.

- 12 credits are reserved for free electives, with advisor's approval.

Required Engineering Components: 15 credits

Students should select four to five engineering courses totaling at least 15 credits in Engineering Components. The Engineering Component of the B.S. in Mathematics Program must be in at least one of the following disciplines:

- Chemical and Biomolecular Engineering
- Civil Engineering
- Computer Engineering
- Computer Science
- Electrical Engineering
- Mechanical Engineering

Interdisciplinary components involving two or more of the fields above will be considered. The courses comprising a math major's engineering component must be approved in advance by an official Mathematics Department advisor.

Sample engineering courses in Engineering Components are listed after the next section.

Total: 126 Credits

Typical Course of Study for the Bachelor of Science in Mathematics

Freshman Year

Fall Semester: 16 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits* OR MA-UY 1324 Integrated Calculus I for Engineers *4 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*

Spring Semester: 15 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits* OR MA-UY 1424 Integrated Calculus II for Engineers *4 Credits*
- MA-UY 3034 Applied Linear Algebra *4 Credits*
  or MA-UY 3044 Linear Algebra
  or MA-UY 3054 Honors Linear Algebra
- PH-UY 1013 Mechanics *3 Credits*

- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Sophomore Year

Fall Semester: 16 Credits

- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- Humanities and Social Sciences Elective #1 *4 Credits*
- Engineering Course #1 *4 credits*

Spring Semester: 16 Credits

- MA-UY 4204 Ordinary Differential Equations *4 Credits*
  or MA-UY 4214 Applied Ordinary Differential Equations
- Math Elective #1 *4 credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- Humanities and Social Sciences Elective #2 *4 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*

Junior Year

Fall Semester: 16 Credits

- MA-UY 3014 Applied Probability *4 Credits*
- MA-UY 4414 Applied Partial Differential Equations *4 Credits*
- Humanities and Social Sciences Elective #3 *4 Credits*
- Engineering Course #2 4 *credits*

Spring Semester: 16 Credits

- MA-UY 4114 Applied Statistics *4 Credits*
- MA-UY 4434 Applied Complex Variables *4 Credits*
- Humanities and Social Sciences Elective #4 *4 Credits*
- Engineering Course #4 *4 Credits*

Senior Year

Fall Semester: 15 Credits

- MA-UY 4614 Applied Analysis *4 Credits*
- MA-UY 4444 Intro to Math Modeling *4 Credits*
- Engineering Course #4 *3 Credits*
- Free Elective #1 4 *Credits*

Spring Semester: 16 Credits

- MA-UY 4424 Numerical Analysis *4 Credits*
- Math Elective #2 4 *Credits*
- Free Elective #2 4 *Credits*
- Free Elective #3 4 *Credits*

Total credits required for the degree: 126 Credits

Sample Engineering Components

Chemical & Biomolecular Engineering

- CBE-UY 1002 Introduction to Chemical and Biomolecular Engineering *2 Credits*
- CBE-UY 2124 Analysis of Chemical and Biomolecular Processes *4 Credits*
- CBE-UY 3153 Chemical and Biomolecular Engineering Thermodynamics *3 Credits*
- CBE-UY 3313 Transport I *3 Credits*
- CBE-UY 3323 Transport II *3 Credits*

Civil Engineering

- CE-UY 2133 Engineering Mechanics *3 Credits*
- CE-UY 2123 Mechanics of Materials *3 Credits*
- CE-UY 2213 Fluid Mechanics and Hydraulics *3 Credits*
- CE-UY 3122 Structural Dynamics *2 Credits*
- CE-UY 3133 Structural Analysis *3 Credits*
- CE-UY 2343 Transportation Engineering *3 Credits*

Computer Engineering

- ECE-UY 2013 Fundamentals of Electric Circuits I *3 Credits*
- ECE-UY 2024 Fundamentals of Electric Circuits II *4 Credits*
- CS-UY 2204 Digital Logic and State Machine Design *4 Credits*
- ECE-UY 4144 Introduction to Embedded Systems Design *4 Credits*

Computer Science

- CS-UY 1134 Data Structures and Algorithms *4 Credits*
- CS-UY 2124 Object Oriented Programming *4 Credits*
- CS-UY 2413 Design and Analysis of Algorithms *3 Credits*
- CS-UY 2xxx or Upper Level Elective *4 Credits*

Electrical Engineering

- ECE-UY 2013 Fundamentals of Electric Circuits I *3 Credits*

- ECE-UY 2024 Fundamentals of Electric Circuits II *4 Credits*
- ECE-UY 3054 Signals and Systems *4 Credits*
- ECE-UY 3114 Fundamentals of Electronics I *4 Credits*
- ECE-UY 3124 Fundamentals of Electronics II *4 Credits*

Mechanical Engineering

- ME-UY 2813 Introduction to Materials Science *3 Credits*
- ME-UY 2811 Materials Science Laboratory *1 Credits*
- ME-UY 2213 Statics *3 Credits*
- ME-UY 2211 Statics Laboratory *1 Credits*
- ME-UY 3333 Thermodynamics *3 Credits*
- ME-UY 3213 Mechanics of Materials *3 Credits*
- ME-UY 3313 Fluid Mechanics *3 Credits*

Master of Science

Mathematics, Examination Option and Designated Subspecialty Option, M.S.

Requirements for the Master of Science

A Bachelor's Degree in Mathematics is required for admission to this program. Students with degrees in other fields may possibly be admitted, with undergraduate deficiencies, at the discretion of departmental advisers. Before beginning graduate studies, students are expected to have completed a one-year course in advanced calculus.

Thirty credits are required. Six credits may be devoted to a thesis.

Required (core) courses, 12 credits, 3 credits each:

- MA-GY 7033 Linear Algebra I *3 Credits*
- MA-GY 7043 Linear Algebra II *3 Credits*
- MA-GY 6213 Elements of Real Analysis I *3 Credits*
- MA-GY 6223 Elements of Real Analysis II *3 Credits*

By Examination Option + Designated Sub-specialty Option:

Elective: *18 credits*. At least 9 credits in courses approved for specialization by Department.

Note:

Includes a comprehensive oral examination before the degree is awarded. Examinations cover the student’s program of study and are scheduled towards the end of the semester in which the work is completed.

Total: 30 Credits

Mathematics, Examination Option, M.S.

Requirements for the Master of Science

A Bachelor's Degree in Mathematics is required for admission to this program. Students with degrees in other fields may possibly be admitted, with undergraduate deficiencies, at the discretion of departmental advisers. Before beginning graduate studies, students are expected to have completed a one-year course in advanced calculus.

Thirty credits are required. Six credits may be devoted to a thesis.

Required (core) courses, 12 credits, 3 credits each:

- MA-GY 7033 Linear Algebra I *3 Credits*
- MA-GY 7043 Linear Algebra II *3 Credits*
- MA-GY 6213 Elements of Real Analysis I *3 Credits*
- MA-GY 6223 Elements of Real Analysis II *3 Credits*

Electives:

18 credits, possibly with up to 9 from approved subspecialities in other departments.

Note:

Includes a comprehensive oral examination before the degree is awarded. Examinations cover the student's program of study and are scheduled towards the end of the semester in which the work is completed.

Total: 30 Credits

Mathematics, Thesis Option, M.S.

Requirements for the Master of Science

A Bachelor's Degree in Mathematics is required for admission to this program. Students with degrees in other fields may possibly be admitted, with undergraduate deficiencies, at the discretion of departmental advisers. Before beginning graduate studies, students are expected to have completed a one-year course in advanced calculus.

Thirty credits are required. Six credits may be devoted to a thesis.

Required (core) courses, 12 credits, 3 credits each:

- MA-GY 7033 Linear Algebra I *3 Credits*
- MA-GY 7043 Linear Algebra II *3 Credits*
- MA-GY 6213 Elements of Real Analysis I *3 Credits*

- MA-GY 6223 Elements of Real Analysis II *3 Credits*

Thesis Option:

Electives: *12 credits*
Master's Thesis: *6 credits*

Note:

Requires an examination of the thesis material by faculty advisers and certification that the work is satisfactory.

Total: 30 Credits

Department of Mechanical and Aerospace Engineering

Chair: Richard Thorsen

Mission Statement

The mission of the Department of Mechanical and Aerospace Engineering is to prepare students for careers in mechanical and related engineering disciplines for professional development, life-long learning and contributions to society.

Furthermore, the department adds value to the student's market and career potential by emphasizing an understanding of the physical world through projects, tools and practice, and by providing the foundation tools for innovation, invention and entrepreneurship.

The Department

The Department of Mechanical and Aerospace Engineering is an ideal destination for U.S. and international students interested in joining a dynamic department that offers educational and research opportunities in traditional and emerging areas of mechanical engineering. The department not only stresses creativity and innovation, but also emphasizes fundamental understanding of the underlying sciences, design methodologies and economic and social impact of engineered products. NYU Tandon School of Engineering graduates hold leadership positions worldwide in careers spanning academia, industry and governmental and non-governmental organizations in both the engineering and other professional fields.

The undergraduate mechanical engineering curriculum balances fundamental science and engineering principles and engineering practice. Courses emphasize engineering science fundamentals and computer applications that employ modern engineering tools. The program heavily emphasizes laboratory experience, engineering design and student participation in research programs.

Graduate studies provide a broad understanding of the mechanical engineering field combined with a deep understanding of one of its sub-disciplines, while they promote interdisciplinary studies, student professional development and lifelong learning skills. Traditional and emerging mechanical engineering- related areas of study are available. Program flexibility allows students to satisfy intellectual interests and pursue professional goals. Coursework and research opportunities are available in areas that include dynamical and complex systems, controls, composite materials and nano-materials, biomimetics, lasers and optical sensors, fluid mechanics and energy systems and fire research. State-of-the-art laboratory and computational facilities support the educational and research enterprise, while the low faculty-to-student ratio warranties the development of close student-faculty ties. The graduate program's relatively small size allows students to form close relationships with their faculty adviser, greatly strengthening and enriching the students' experience and intellectual growth.

Students are encouraged to join NYU Tandon's student chapters of the American Society of Mechanical Engineers (ASME), American Institute of Aeronautics and Astronautics (AIAA), National Society of Black Engineers (NSBE), Engineers Without Borders (EWB), Society of Women Engineers (SWE) and Society of Automotive Engineers (SAE), as well as honor societies, Pi Tau Sigma for mechanical engineers and Tau Beta Pi for engineers in general.

NYU Tandon students benefit significantly from participation in cutting-edge research (funded by government, industry and not-forprofit organizations), access to state-of-the-art laboratories, collaboration with a faculty that cares greatly for students and devotes its energy to their growth, and living in one of the world's greatest cities.

The Profession

Mechanical engineers design, build and maintain the products and processes that define industrial and post-industrial societies. In its early days, mechanical engineering emerged as the discipline dedicated to producing power and building the first industrial machines. Mechanical engineering has evolved to the broadest of all engineering disciplines. Today, mechanical engineers are prime movers of innovation and invention in a wide range of dynamic and continually evolving industries. These industries include power production and aerospace, robotics and manufacturing, transportation and communication, electronics and mechatronics, and biotechnology and biomimetics. Mechanical engineers also have a long tradition of leadership in helping to develop and safeguard the natural environment by creating breakthroughs in such areas as resource conservation, improved efficiency of energy-consuming devices, development of codes for a safer technological environment, and new green energy sources. The breadth of their training allows some mechanical engineers to apply their training to the diversified fields of computer engineering, nanotechnology, software development, financial engineering, bioengineering, astronautics, systems engineering, corporate management, law and medicine. As NYU Tandon graduates mature and realize their abilities, their professional lives may center on engineering research, government, business, education or entrepreneurship.

Contact Information

NYU Tandon School of Engineering
Six MetroTech Center
Brooklyn, NY 11201

Web: http://engineering.nyu.edu/academics/departments/mechanical

Degrees Offered

The department offers degree programs in mechanical engineering at the Bachelor of Science, Master of Science and Doctor of Philosophy levels. The undergraduate Bachelor of Science program is accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board of Engineering and Technology (ABET).

The objectives of the undergraduate mechanical-engineering program are for its graduates to: 1) engage in, and advance in, professional careers in mechanical or related engineering, or other career paths that include industry, academia and governmental or nongovernmental organizations, and 2) seek continuous professional development and life-long learning through graduate-school studies, continuing-education credits and professional registration.

The department offers BS, MS and PhD degrees in mechanical engineering. Further information on the programs can be found here.

Bachelor of Science

- Mechanical Engineering, B.S.
  - Aerospace Engineering Minor
  - Biomechanical and Biosystems Engineering Minor
  - Mechanical Engineering Minor
  - Nuclear Sciences and Engineering Interdisciplinary Minor
  - Robotics Minor

Master of Science

- Mechanical Engineering with concentrations in mechanics and structural systems, controls and dynamic systems, fluid dynamics and thermal systems, and energy engineering and policy
- Mechatronics and Robotics, M.S.

Doctor of Philosophy

- Mechanical Engineering, Ph.D. with concentrations in aerospace engineering, materials engineering, mechanics and structural systems, controls and dynamic systems, fluid dynamics and thermal systems, and energy engineering and policy

Faculty

Professors

Kurt H. Becker, Professor of Mechanical Engineering and Applied Physics and Vice Dean for Research, Innovation and Entrepreneurship
PhD, Univeritaet des Saarlandes, Germany
Atomic, molcular and chemical physics, plasma physics

Vikram Kapila, Professor of Mechanical Engineering
PhD, Georgia Institute of Technology
Linear/nonlinear control, distributed spacecraft formation flying and attitude control, mechatronics

Sunil Kumar, Professor of Mechanical Engineering and Associate Provost for Abu Dhabi Engineering
PhD, University of California at Berkeley
Thermal fluid sciences, applied mathematics

Said Nourbakhsh, Professor of Materials Science
PhD, Leeds University (England)
Phase transformation, electron microscopy, composite and smart materials, ferroelectric thin films

Maurizio Porfiri, Professor of Mechanical and Aerospace Engineering
PhD, Virginia Polytechnic Institute and State University
Dynamical systems theory and applications, mechanics of advanced materials, multiphysics modelling, smart materials and structures

Katepalli Sreenivasan, Professor of Mechanical Engineering, NYU University Professor
PhD, Indian Institute of Science
Fluid dynamics, turbulence, complex fluids, cryogenic helium, nonlinear dynamics

Associate Professors

Nikhil Gupta, Associate Professor of Mechanical Engineering
PhD, Louisiana State University
Micro- and nano-composite materials/mechanics

Joo Hyun Kim, Associate Professor of Mechanical Engineering and Assistant Professor of Physical Therapy at New York University
PhD, The University of Iowa
Multibody system dynamics, optimization control, robotics, bioemechanics

Richard S. Thorsen, Associate Professor of Mechanical and Aerospace Engineering, Department Chair, and Vice President Emeritus
PhD, New York University
Heat transfer, energy systems, solar and nuclear energy

George Vradis, Associate Professor of Mechanical Engineering
PhD, Polytechnic University
Computational fluid dynamics and heat transfer, energy systems

Assistant Professors

Weiqiang Chan, Assistant Professor of Mechanical and Aerospace Engineering
PhD, University of Michigan

Chen Feng, Assistant Professor of Civil and Mechanical Engineering
PhD, University of Michigan
Robotic Vision and Learning, withapplications for Automation in Civil Engineering

Giuseppe Loianno, Assistant Professor
PhD, University of Naples Federico II

Industry and Research Professors

Rakesh Bahera, Industry Assistant Professor
PhD, University of Florida
Materials, Computational Materials Science

Joseph Borowiec, Industry Professor
PhD, Polytechnic Institute of New York
Finite elements method, structural mechanics, design

Nicholas Dizinno, Industry Associate Professor
MS, Polytechnic University
Computer-Aided Design, Thermal Sciences

Sang-Hoon Lee, Industry Associate Professor
PhD, Polytechnic University
Measurement systems and automatic control

Dung Luong, Industry Assistant Professor
PhD, Polytechnic Institute of NYU
Composite materials

Iskender Sahin, Industry Professor
PhD, Virginia Polytechnic Institute and State University
Thermal and fluid systems

Adjunct Faculty

Shabab Baghaei
PhD, City University of New York
Mechanical Engineering

Ghania Benbelkacem
PhD, Institut national polytechnique de Lorraine
Fluid Mechanics, Heat Transfer, Material science

Huseyin Cekirge
PhD, Lehigh University
Applied Mechanics

Anthony Clarke
MS, Binghamton University
Finite Elements Methods

Matthew Frenkel
PhD, Rutgers University
Thermal Sensing, Applied Optics

Andrew Gadzic
MS, Polytechnic University
Manufacturing Engineering and Processes

Kee M. Park
PhD, Stevens Institute of Technology
Machine design

Daniel Speyer
PhD, New York University
Nuclear Power Plant Systems

Paul Sutton
JD, Brooklyn Law School
Intellectual property, intersections of law, engineering and business

Ali Vedavarz
PhD, Polytechnic University
Energy systems, green energy, HVAC

Affiliated Faculty

Salvatore Grimaldi, Associate Professor of Mechanical Engineering and Associate Professor of Applied Hydrology at Universita degli Studi della Tuscia
PhD, Universita di Roma "La Sapienza"
Applied and statistical hydrology, GIS terrain analysis, tracer methods for hydrological applications

Sean Peterson, Assistant Professor of Mechanical Engineering and Assistant Professor of Mechanical & Mechatronics Engineering at University of Waterloo, Canada
PhD, Purdue University
Fluid mechanics, bio-fluid mechanics, energy harvesting

Michael J. Shelley, Professor of Mechanical Engineering and Lilian and George Lyttle Professor of Applied Mathematics at Courant Institute of Mathematical Sciences at New York University
PhD, University of Arizona
Fluid dynamics, computational physics, numerical analysis

Peter S. Walker, Research Professor of Mechanical Engineering and Research Professor of Orthopedic Surgery at New York University Hospital for Joint Diseases
PhD, University of Leeds
Orthopedics, minimally invasive surgery

Faculty Emeriti

Vito D. Agosta, Professor Emeritus
PhD, Columbia University

Anthony E. Armenakas, PE, Professor Emeritus
PhD, Columbia University

William B. Blesser, Professor Emeritus
MEE, Polytechnic Institute of Brooklyn

Irving B. Cadoff, Professor Emeritus
DEngSc, New York University

John R. Curreri, Professor Emeritus
MEE, Polytechnic Institute of Brooklyn

Carmine D'Antonio, Professor Emeritus
MMetE, Polytechnic Institute of Brooklyn

Jerome M. Klosner, PE, Professor Emeritus
PhD, Polytechnic Institute of Brooklyn

Harold Margolin, Professor Emeritus
DEngSc, Yale University

William R. McShane, PE, Professor Emeritus
PhD, Polytechnic Institute of New York

William P. Vafakos, PE, Professor Emeritus
PhD, Polytechnic Institute of Brooklyn
JD, Brooklyn Law School

Mechanical and Aerospace Engineering

Program Director: Richard Thorsen

The Mechanical Engineering Program offers degrees of Bachelor of Science, Master of Science and Doctor of Philosophy in Mechanical Engineering. A Minor in Aerospace Engineering is offered as well as a Biomechanical and Biosystems Engineering Minor, an Interdisciplinary Minor in Nuclear Sciences and Engineering (offered in collaboration with the Department of Applied Physics), and a Robotics Minor. A Mechanical Engineering Minor is offered for students majoring in other engineering disciplines. It is designed to provide students with the fundamentals of the mechanical engineering discipline and allow them to persue careers related to mechanical engineering. Both the aerospace engineering minor and the nuclear sciences and engineering minor can be integrated seamlessly into the BS in Mechanical Engineering program. The BS in Mechanical Engineering can be completed full-time or part-time. There is no evening program, so part-time students take the same classes as full-time students. Transfer students, all of whom must meet minimum residence requirements set by the School, are welcomed. A number of articulation agreements with several colleges provide a smooth transfer to the School. The Office of Undergraduate Admissions, which provides comprehensive support to prospective transfer students, should be consulted for details.

The Mechanical Engineering Program also offers three graduate degrees: a Master of Science in Biomechanical and Biosystems Engineering, a Master of Science in Mechanical Engineering, and a Doctor of Philosophy in Mechanical Engineering. For the Master's and Ph.D. in Mechanical Engineering, students must choose one of the following specialty areas:

- Aerospace engineering (PhD only)
- Controls and dynamic systems
- Energy engineering and policy
- Fluid dynamics and thermal systems
- Materials engineering (PhD only)
- Mechanics and structural systems

All mechanical engineering degrees are offered to full-time and part-time students.

Mechanical Engineering Profession

Mechanical engineering is a dynamic, evolving profession and the most diverse of the engineering disciplines. Mechanical engineers invent, innovate and create the physical systems and devices that define modern society. These systems and devices include automobiles and aircrafts, robots and power plants, medical devices and artificial limbs, and advanced nanomaterials and smart structures. The breadth and depth of mechanical engineering contribute significantly to the development of three technologies that are expected to define the 21st century: bioengineering, nanotechnology and green energy. Undergraduate and graduate mechanical-engineering programs prepare NYU Tandon graduates for practice in diverse technical industries as well as in corporate management, law, medicine and entrepreneurial endeavors.

Aerospace Engineering Profession

Aerospace engineering is the art and science associated with the design and performance of aircraft, spacecraft and other airborne and space-related devices and systems. The scientific aspects of aircraft and spacecraft design are rooted in mechanical engineering and, in particular, in the broad areas of low- and high-speed flows, strength and stability of extremely lightweight structures, aero-thermochemistry and propulsion, guidance and control, materials engineering, and thermodynamics and heat transfer.

Moon and planetary vehicles, deep-space probes and space habitats, once confined to the realm of science fiction, are now realities. Vehicles now under design or projected for the future challenge the imagination. They also challenge the current knowledge base and state of the art of the technologies involved.

To meet these extraordinary challenges, aerospace engineers must understand the scientific principles that give them the greatest possible potential, flexibility and adaptability. Conflicting requirements imposed by such considerations as safety, reliability, cost, maintenance, and production and handling often demand compromises to attain optimum design. Aerospace engineers are responsible to resolve such issues. The hallmark of aerospace engineers is an ability to push the boundaries of knowledge and lead teams of specialists to achieve mission-specific goals. The Minor in Aerospace Engineering prepares students to meet these challenges and follow successful careers in aerospace related industries.

Nuclear Engineering Profession

The Nuclear Engineering field is experiencing a major resurgence from the skeptical public attitude of the 1970s and 1980s that resulted in a stagnated nuclear power industry for more than two decades. At the same time nuclear technologies have emerged in many fields to provide advanced solutions to challenging problems, such as food processing, Instrumentation, diagnostics and perhaps most importantly in the medical industry where many nuclear-based diagnostic and therapeutic procedures have saved and improved the lives of millions. In addition, growing concerns regarding global warming have again shifted the attitude of the public to amore favorable view of the potential benefits of nuclear power, which is inherently carbon free and thus can play a substantial role in curbing carbon dioxide and methane emissions.

To meet the demands of this resurgent industry, engineers proficient in the fundamentals of the nuclear sciences and engineering are needed. Developing new nuclear based medical diagnostic technologies, new electric power reactor systems, inherently safe reactors, nuclear-based sensors, and instruments for non destructive testing of structures and materials are some of the many fields where engineers with knowledge of the fundamentals of this fascinating field can get engaged. The Interdisciplinary Minor in Nuclear Sciences and Engineering prepares graduates for rewarding and successful careers in these nuclear sciences and engineering related fields.

Undergraduate Program

Goals and Objectives

The objectives of the undergraduate BS in Mechanical Engineering program at the NYU Tandon School of Engineering is for its graduates to

- engage and advance in professional careers in mechanical or related engineering, or other career paths that include industry, academia and governmental or non-governmental organizations; and
- seek continuous professional development and lifelong learning through graduate studies, continuing education credits and professional registration.

The Program

To support program goals, the undergraduate mechanical engineering curriculum balances basic scientific and engineering principles and practice. Emphasis in the basic sciences (mathematics, physics, chemistry and materials) as well as basic engineering sciences (mechanics of materials, thermodynamics, fluid mechanics and heat transfer, measurement systems and controls) is balanced by a parallel emphasis in engineering practice: laboratory experience, engineering design and computer-based analysis and design.

During the program's first two years, a series of courses in mathematics, from calculus to multivariable calculus and differential equations, provides students with the backgroundto understand and to solve complex equations of engineering physics. A series of courses in physics introduces the fundamentals of the physical world in all areas, including modern physics. Finally, a series of courses in chemistry, materials science and computer science introduce these fields, which are at the core of modern engineering research and practice, to the students.

A series of courses in the basic engineering sciences build on the knowledge acquired in mathematics, physics and materials sciences to provide the fundamental knowledge at the core of modern mechanical engineering. Engineering mechanics (statics and dynamics), mechanics of materials, thermodynamics, fluid mechanics, heat transfer, measurement systems and control systems form the basis of modern mechanical engineering. They also provide the needed foundation for students to excel in any major subdiscipline in mechanical engineering. Another series of courses that includes computer-aided design, finite elements method and machine design, introduces students to the tools of modern mechanical-engineering practice. Computerbased tools have emerged over the last 20 years to revolutionize the practice of mechanical engineering, offering unsurpassed capabilities in analyzing and simulating complex engineering systems, as well as increasing dramatically engineering-enterprise productivity. In dedicated classes, students learn to use the latest, state-of-the-art computer tools.

This required course work is complemented by a series of seven mechanical-engineering laboratory courses in materials science, statics, mechanics of materials, measurement systems, automatic controls, fluid mechanics and heat transfer. Finally, the students are given the opportunity to select from a broad range of elective courses to complement their education by building breadth and depth in one or more mechanical engineering sub-disciplines. Popular offerings over the last few years have been courses in energy systems, heating, ventilation and air-conditioning systems, nanomaterials and composites, mechatronics, microelectromechanical systems and in intellectual-property strategies for engineers.

Throughout the curriculum, a series of courses introduces the concepts, methods and tools of engineering design. Emphasis is on the systematic process of design and the related innovation and creative content. Three aspects of design addressed through the course content are

- the concept of design and the corresponding concept of multiple solutions;
- the process of design; and
- the tools and skills for design.

The first aspect of design includes both the creative element, since the problem most likely lacks a unique solution, and project work. The second includes introduction to the systematic process of design, represented by concurrent engineering, quality management and the product-realization process, as well as other emerging concepts that set the framework for modern design. The third includes design tools, such as Computer Aided Design (CAD), Computational Fluid Dynamics (CFD) and Finite Element Analysis (FEA), as well as the underlying engineering theory for designing and analyzing components and systems.

The curriculum of integrated design exposure and experience evolves over the four years of the program. In their first year, students take EG-UY 1001 Engineering and Technology Forum, EG-UY 1003 Introduction to Engineering and Design, and ME-UY 1012 Introduction to Mechanical Engineering, to gain an initial comprehensive exposure to how things are designed and built. These courses also introduce students to ethical issues in engineering research and practice. Students work in team projects and learn the basics of effective, professional report writing and presentations. Sophomore students take ME-UY 2112 Computer Aided Design, where they are introduced to state-of-the-art computer-aided drafting tools, ME-UY 2213 Statics, and ME-UY 2211 Statics Laboratory, to enhance their understanding of static equilibrium of rigid bodies, and ME-UY 2813 Introduction to Materials Science, and ME-UY 2811 Materials Science Laboratory, to study the structure of engineering materials and examine the impact of material properties on design.

In the junior year, students take ME-UY 3513 Measurement Systems, to learn how to design experiments; ME-UY 3333 ME-UY 3333 Thermodynamics, to understand the design of thermodynamic systems; ME-UY 3313 Fluid Mechanics, to understand design of fluid and thermal systems; ME-UY 3233 Machine Design, to consider the design aspects of machines and mechanical systems; ME-UY 3223 Dynamics, to consider the design of systems where motion is involved; and ME-UY 3413 Automatic Control, to explore the control of mechanical, aerospace, robotic, thermofluid, and vibrating systems and processes.

Finally, the design experience culminates with the Capstone ME-UY 4112 Senior Design I and ME-UY 4113 Senior Design II courses, during which students work in teams of four to six to conceptualize, design, fabricate and test an engineering product or system. In addition to the systematic and creative processes of design, the capstone design experience includes engineering consideration of safety, ethics, economic analysis, project planning, and budgeting and quality. These courses focus heavily on communications aspects, including report writing and oral presentations. Finally, many mechanical engineering elective courses offered contain significant design experience.

Placement

Graduates of the Mechanical Engineering Bachelor of Science program are employed in a wide range of industries, including primarily

- National defense
- Aerospace
- Energy generation and distribution
- Telecommunications
- Consulting firms (mostly infrastructure related)
- Petrochemical, Pharmaceutical and other process industries
- Government
- A variety of small and medium size engineering firms

At the same time, NYU Tandon graduates find opportunities in emerging fields, such as in biomedical systems and devices, nanotechnology and mechatronics. Alumni have used their basic mechanical engineering education as a springboard to law, medicine, corporate management and entrepreneurial ventures.

Finally, a substantial number of graduates continue their studies toward a Master of Science (MS) or Doctor of Philosophy (PhD) degree in mechanical or related disciplines. Some of those obtaining a PhD degree pursue rewarding careers in academia and research organizations.

Special Departmental Requirements

For graduation, students must meet the School requirement of a 2.0 GPA or better. Seniors with GPAs of 3.5 or better may take certain graduate courses as electives with approval from the departmental adviser. Students on academic probation usually are permitted to preregister for the next semester, but are obliged to consult with their adviser after grades are posted and before classes begin. In addition, all ME majors must satisfy the following minimum GPA requirements, as table below:

Number of Full-Time Semesters Completed	Minimum Required Cumulative GPA	Minimum Number of Credits Earned
1	1.50	8
2	1.70	16
3	1.85	28
4	2.0	40

5	2.0	56
6	2.0	68
7	2.0	84
8	2.0	96
9	2.0	112
10	2.0	128

Any student who does not meet the requirements above after the first semester will be automatically placed on final probation. Any student who does not meet the requirements above after the second semester will be automatically disqualified.

Transfer Students

All transfer students must meet the Institute's minimum residency requirement of 66 credits. In addition, transfer students in the Mechanical Engineering Program are required to take all junior and senior mechanical engineering courses and technical electives at NYU Tandon. Qualified graduates of two-year pre-engineering programs, such as those offered at several community colleges and four-year liberal-arts colleges, often may fulfill the requirements for BS in Mechanical Engineering in two additional years. Since such programs vary from college to college, students should meet with the mechanical engineering undergraduate adviser for guidance. The School has formal articulation agreements with some colleges; as a result, students from these schools have a series of transfer courses preapproved. Students with some course work toward a degree also may apply for transfer credit upon application to NYU Tandon. In all cases, transfer credit is granted based upon equivalence to NYU Tandon courses.

The process is expedited by previous decisions. Past transfer credit granted to students from the same college is a good indicator for prospective students. However, the adviser must be consulted in all cases for a current decision. Course content changes over the years at NYU Tandon and other colleges, and content comparison determines decisions in each case. Transfer students are strongly encouraged to meet with the undergraduate adviser apart from the registration process to achieve a proper evaluation. The Office of Undergraduate Admissions offers information on past decisions for a given college and can arrange a meeting with the departmental undergraduate adviser. Graduates of technology programs may be able to fulfill the requirements for a BS in Mechanical Engineering in two to three-and-one-half years depending upon the scope and level of their previous education. The same is true for graduates of practical engineering and other such programs in various countries. Consult with the undergraduate adviser for details.

Typical Program of Study for the Bachelor of Science Degree

The program consists of five components:

- Engineering core, *50 credits*
- $STEM^2$ electives, *6 credits*
- Mathematics, sciences and introduction to engineering, *42 credits*
- Humanities and social sciences, *24 credits*
- Free electives, *9 credits*

Graduate Program

Programs of study that lead to the MS and PhD degrees in Mechanical Engineering are available in each of five specialty areas:

- Aerospace engineering (PhD only)
- Controls and dynamic systems (MS and PhD)
- Fluid dynamics and thermal systems (MS and PhD)
- Materials engineering (PhD only)
- Mechanics and structural systems (MS and PhD)

A bachelor's degree and a good academic record in mechanical engineering from a reputable college or university are generally required for admission to the graduate program. Students with exceptional undergraduate performance (typically with a GPA of 3.5 or better) can be admitted directly to the PhD program. Applicants with degrees from fields other than mechanical engineering may be admitted, but may have to complete additional studies to achieve a comparable background. Courses required to achieve this status are specified as part of the admission evaluation. Undergraduate courses specified for this purpose cannot count toward credits for the graduate degree. Graduate programs are subject to prior approval of a graduate adviser designated by the department.

To graduate, all students are required to have a 3.0 GPA or better in each of the following: in the average of all graduate courses taken at NYU Tandon (whether or not some of these courses are being used to satisfy specific degree requirements); in the average of all courses submitted for the graduate degree sought (MS or PhD); in each guided studies, readings, projects, thesis and dissertation courses or credits enrolled.

Goals and Objectives

The objectives of the MS in Mechanical Engineering are for its students to acquire the skills necessary to:

- develop in-depth expertise in at least one subdiscipline of mechanical engineering (e.g., Energy Engineering and Policy; Mechanics and Structural Systems; and Controls and Dynamic Systems) to prepare for a rewarding professional career or for studies toward a PhD or other degrees;
- diversify their knowledge by taking advanced courses in other disciplines; and
- enhance their professional careers by acquiring knowledge of how to formulate, analyze and design components and systems by using modern advanced analytical and computational-engineering tools.

The objectives of the PhD in Mechanical Engineering are for its students to master the skills necessary to:

- obtain deep knowledge in one of the areas of mechanical engineering (e.g., materials, aerospace, energy engineering and policy, mechanics and structural systems and controls and dynamic systems) through advanced courses and research;
- obtain a broad understanding of other engineering and science disciplines so they can participate in interdisciplinary research;
- identify problems, formulate research programs to address them, conduct research and produce results that advance the fundamental understanding of a certain subdiscipline by completing a dissertation in the chosen subdiscipline; and
- communicate results of their research and other work effectively through conference presentations and refereed journal publication.

Double-Degree Partnerships

Double-Degree Partnership with Sapienza University of Rome

The department offers a double-degree option in Mechanical Engineering from the Sapienza University of Rome and NYU Tandon. Students complying with the degree requirements of both institutions will be granted a double-degree. Details for the program can be found on the departmental website.

Double-Degree Partnership with the Polytechnic of Bari

The department offers a double-degree option in Mechanical Engineering with a concentration in Dynamic Systems and Control from the Polytechnic of Bari and NYU Tandon. Students complying with the degree requirements of both institutions will be granted a double degree. Details for the program can be found on the departmental website.

Non-Degree

Aerospace Engineering Minor

The Department of Mechanical and Aerospace Engineering offers a minor in Aerospace Engineering that consists of the following five courses, totaling 15 credits, which provide students with the foundation needed to pursue a career in the aerospace industry or graduate studies in the field:

Required Courses:

- ME-UY 3213 Mechanics of Materials *3 Credits*
- AE-UY 4603 Compressible Flow *3 Credits*
- AE-UY 4613 Aerodynamics *3 Credits*
- AE-UY 4633 Aerospace Propulsion *3 Credits*
- AE-UY 4653 Aircraft Flight Mechanics *3 Credits*

Note:

Students pursuing the BS in Mechanical engineering degree may complete the aerospace engineering minor by taking the four AE designated courses in place of two STEM[2] and two Free Electives available in the program. Please see Mechanical Engineering, Aerospace Minor, B.S. for more details.

In order for the Minor to be awarded and recorded on the official student transcript, the student has to obtain an overall 2.00 GPA in the Minor courses.

Contact Information:

Departmental Adviser: Joseph Borowiec

borowiec@nyu.edu

Biomechanical and Biosystems Engineering Minor

The field of Biomedical Engineering (BME)/Bioengineering is at the interface of engineering, life sciences, technology, and medicine, and has been articulated as an ever more prominent field in the engineering and medical sciences. Engineers working in this specialty apply engineering principles to the medical and biological sciences to design and develop equipment, devices, computer systems, software, and molecular and cellular engineering tools used in the medical, biotechnological, and pharmaceutical fields.

The Minor was designed to provide students with a basic proficiency in fundamental core areas in the field of BME/Bioengineering. Students are required to take a total of 16 credits satisfied by five core courses in the Minor, as shown below. BMS-UY 1004 is an established course. All ME courses offered in this track are new.

Required Courses:

- BMS-UY 1004 Introduction to Cell and Molecular Biology *4 Credits*
- ME-UY 4623 Biomechanics *3 Credits*
- ME-UY 4633 Biomaterials *3 Credits*
- ME-UY 4643 Biofluid Mechanics *3 Credits*
- ME-UY 4653 Introduction to BioMEMS and Microfluidics *3 Credits*

Note:

In order for the Minor to be awarded and recorded on the official student transcript, the student has to obtain an overall 2.00 GPA in the Minor courses.

Contact Information:

Departmental Adviser: Joseph Borowiec

borowiec@nyu.edu

Mechanical Engineering Minor

The Minor requires students to take a total of 15 credits in Mechanical Engineering courses. Nine of these credits are in three core courses (selected from a list of four courses), while another six credits of two elective courses come from a list of six courses as shown below. If a student has taken an equivalent course in their own major (e.g., Statics in Civil Engineering), that course will not count toward the Minor. In such a case the student will need to complete an approved ME substitute course so that the total number of completed ME courses still equals 15 credits.

Note: In order for the Minor to be awarded and recorded on the official student transcript, the student has to obtain an overall 2.00 GPA in the Minor courses.

Core Courses (choose three out of the listed four):

- ME-UY 2213 Statics *3 Credits*
- ME-UY 3333 Thermodynamics *3 Credits*
- ME-UY 3223 Dynamics *3 Credits*
- ME-UY 2813 Introduction to Materials Science *3 Credits*

Elective Courses (choose two out of the listed six):

- ME-UY 3213 Mechanics of Materials *3 Credits*

- ME-UY 3233 Machine Design *3 Credits*
- ME-UY 3313 Fluid Mechanics *3 Credits*
- ME-UY 3413 Automatic Control *3 Credits*
- ME-UY 3513 Measurement Systems *3 Credits*
- ME-UY 4313 Heat Transfer *3 Credits*

Contact Information:

Departmental Adviser: Joseph Borowiec

borowiec@nyu.edu

Nuclear Sciences and Engineering Interdisciplinary Minor

The Department of Mechanical and Aerospace Engineering, in collaboration with the Department of Applied Physics, offers a minor an Interdisciplinary Minor in Nuclear Sciences and Engineering that consists of the following five courses, totaling 15 credits, that provide students with the foundation needed to pursue a career in the nuclear sciences and engineering industries or graduate studies in the field:

Course Requirements:

Please refer to the Nuclear Sciences and Engineering Minor page for course requirements.

Note:

Students pursuing the BS in Mechanical Engineering degree may complete the Interdisciplinary Minor in Nuclear Sciences and Engineering by taking the five courses as appropriate replacements for $STEM^2$, Free, and/or Humanities electives.

In order for the Minor to be awarded and recorded on the official student transcript, the student has to obtain an overall 2.00 GPA in the Minor courses.

Contact Information:

Departmental Adviser: Joseph Borowiec

borowiec@nyu.edu

Robotics Minor

Minor in Robotics

The Minor in Robotics provides students with a foundation in the fundamental areas of the interdisciplinary field of robotics. Together with a degree in engineering or computer science, the Minor in Robotics prepares students for careers and graduate studies in robotics. Students may obtain a Minor in Robotics by taking the following courses.

ROB-UY 2004 Robotic Manipulation and Locomotion
ROB-UY 3203 Robot Vision
ROB-UY 3303 Robot Motion and Planning
ROB-UY 3404 Haptics and Telerobotics in Medicine

In order for the Minor to be awarded and recorded on the official student transcript, the student must obtain an overall 2.00 GPA in the Minor courses.

Prerequisites

The courses for the Minor in Robotics have the following prerequisites in computer science, mathematics, and physics.

1) Computer Science - Introduction to Programming
2) Mathematics - Differential Equations and Linear Algebra
3) Physics - Mechanics

Students at NYU Tandon and other schools of NYU who meet the prerequisites may enroll in ROB-UY courses. Various courses across NYU schools and NYU global campuses satisfy these prerequisites, as follows.

1) The Computer Science prerequisite is satisfied by any of the following: CS-UY 1114 or CS-UY 1113 or CS-UY 1133 or ENGR-UH 1000 or CS-UH 1001 or CSCI-SHU 11 or CSCI-SHU 101.

2) The Mathematics prerequisites is satisfied by a single course covering linear algebra and differential equations: MA-UY 2034 or MATH-SHU 265

or by separate courses in linear algebra:
MA-UY 3034 or MATH-UA 140 or MATH-UH 1022 or MATH-SHU 140

and differential equations:
MA-UY 4204 or MATH-UA 262 or MATH-UH 1024 or MATH-SHU 262

3) The Physics prerequisite is satisfied by any of the following: PH-UY 1013 or PHYS-UA 11 or PHYS-UA 91 or ENGR-UH 2012 or PHYS-SHU 11 or PHYS-SHU 91

Notes

'UH' designates courses offered at NYU-Abu Dhabi
'SHU' designates courses offered at NYU-Shanghai

Contact Information

Students with questions about the Minor in Robotics can contact an Undergraduate Academic Advisor in either the Department of Electrical and Computer Engineering (ECE) or the Department of Mechanical and Aerospace Engineering (MAE).

Bachelor of Science

Mechanical Engineering, B.S.

Typical Course of Study for the Bachelor of Science in Mechanical Engineering

Freshman Year

Fall Semester: 16 Credits

- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*
- MA-UY 1024 Calculus I for Engineers *4 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*

Spring Semester: 16 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- ME-UY 1012 Introduction to Mechanical Engineering *2 Credits*
- CS-UY 1133 Engineering Problem Solving and Programming *3 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Sophomore Year

Fall Semester: 18 Credits

- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- ME-UY 2811 Materials Science Laboratory *1 Credits*
- ME-UY 2813 Introduction to Materials Science *3 Credits*
- ME-UY 2112 Computer Aided Design *2 Credits*
- Humanities and Social Sciences Elective *4 Credits* [1]

Spring Semester: 16 Credits

- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- MA-UY 2224 Data Analysis *4 Credits*
- ME-UY 2211 Statics Laboratory *1 Credits*
- ME-UY 2213 Statics *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*

Junior Year

Fall Semester: 18 Credits

- ME-UY 3333 Thermodynamics *3 Credits*
- ME-UY 3211 Mechanics of Materials Laboratory *1 Credits*
- ME-UY 3213 Mechanics of Materials *3 Credits*
- ME-UY 3511 Measurement Systems Laboratory *1 Credits*
- ME-UY 3513 Measurement Systems *3 Credits*
- ME-UY 3223 Dynamics *3 Credits*
- Humanities and Social Sciences Elective *4 Credits* [1]

Spring Semester: 14 Credits

- ME-UY 3233 Machine Design *3 Credits*
- ME-UY 3311 Fluid Mechanics Laboratory *1 Credits*
- ME-UY 3313 Fluid Mechanics *3 Credits*
- ME-UY 3411 Automatic Control Laboratory *1 Credits*
- ME-UY 3413 Automatic Control *3 Credits*
- STEM[2] Elective *3 Credits*[2]

Senior Year

Fall Semester: 17 Credits

- ME-UY 4112 Senior Design I *2 Credits*
- ME-UY 4214 Finite Element Modeling, Design and Analysis *4 Credits*
- ME-UY 4311 Heat Transfer Laboratory *1 Credits*
- ME-UY 4313 Heat Transfer *3 Credits*
- STEM[2] Elective *3 Credits*[2]
- Humanities and Social Sciences Elective *4 Credits* [1]

Spring Semester: 16 Credits

- ME-UY 4113 Senior Design II *3 Credits*
- Free Elective *3 Credits* [3]
- Free Elective *3 Credits*[3]
- Free Elective *3 Credits*[3]
- Humanities and Social Sciences Elective *4 Credits* [1]

Total credits required for the degree: 131 Credits

Footnotes

[1] Students must take sixteen credits (four courses) of elective courses in the humanities and social sciences. Consult the Department of Technology, Culture and Society portion of the bulletin for details. At least one humanities and social sciences (HuSS) elective must be a 3xxx/4xxx level course. At least one humanities and social sciences elective must be a writing-intensive course, labeled by "W."

[2] STEM[2] electives are satisfied by the following courses:

- a) Any level 2 or higher course starting with the prefix AE-UY, BMS-UY, CBE-UY, CM-UY, CE-UY, CS-UY, ECE-UY, FIN-UY, DM-UY, MA-UY, ME-UY, MG-UY, PH-UY, STS-UY, or VIP-UY
- b) Any graduate course starting with BE-GY, BI-GY, BT-GY, BTE-GY, CBE-GY, CM-GY, CE-GY, CS-GY, FRE-GY, DM-GY, IE-GY, MG-GY, MA-GY, ME-GY, or TR-GY
- Any course which satisfies Humanities credit must be in excess of the NYU Tandon 24 credit Humanities and Social Sciences (HuSS) requirement to be eligible for STEM[2] elective credit. Double-counting HuSS credit and STEM[2] credit is not permitted.

[3] A free elective is any course in any department of the University for which the student has the prerequisites. Free electives may include internships for credit (CP-UY 2xxx or Study Abroad courses). A total of six internship credits may be applied to the BSME degree. Letter graded and pass/fail approved internship courses are allowable. In general, all other Free Electives must be letter graded.

Master of Science

Mechanical Engineering, Controls and Dynamic Systems Specialty, M.S.

Requirements for the Master of Science

Course requirements for the MS in Mechanical Engineering are suited to the applicant's specialty, which is specified by the student in the admissions process or during the first advising session. Students must take at least 21 credits out of the 30 credits needed for the degree at the NYU Tandon School of Engineering. No more than 6 credits in "Guided Reading" courses are allowed. Validation credit is not allowed, but the graduate adviser may waive specific requirements (and substitute designated ones), based upon the student's prior studies or experience. Transfer credits are not granted for:

- undergraduate courses;
- courses counted toward satisfying undergraduate degree requirements;
- courses not related to the graduate program as stated in this catalog;
- courses that received a grade lower than B.

The degree requirements are:

- ME-GY 6003 Applied Mathematics in Mechanical Engineering *3 Credits*
- ME-GY 6043 Thermal Engineering Fundamentals *3 Credits*
- ME-GY 6213 Introduction to Solid Mechanics *3 Credits*
- ME-GY 6703 Linear Control Theory and Design I *3 Credits*
- ME xxxx Required for Specialty Area (see below) *6 Credits*
- ME xxxx Electives, approved by graduate adviser *6 Credits*
- Free Electives *6 Credits*

Total: 30 Credits

Note:

If students decide to do a ME 997x Master Thesis (9 credits) as part of their work for the degree, these 9 credits will be counted against 3 credits out of the 6 credits in ME electives, 3 credits out of the 6 credits in ME Required for the Specialty Area credits and 3 credits out of the 6 credits of Free Electives. Students are not allowed to submit more than three courses (9 credits) starting with a 5 for MS degree requirements satisfaction. Departmental electives include courses with a mechanical (ME), aerospace (AE) or materials (MT) prefix, plus departmental thesis or project credits. All courses and program details are subject to adviser approval.

Controls and Dynamic Systems Specialty

In the Controls and Dynamic Systems area, at least two graduate courses come from the list of courses under this heading. See courses below.

Required Courses

3 courses from

- ROB-GY 5103 Mechatronics *3 Credits*
- ME-GY 5653 Microelectromechanical Systems *3 Credits*
- ME-GY 6613 Sensor Based Robotics *3 Credits*
- ME-GY 6703 Linear Control Theory and Design I *3 Credits*
- ME-GY 6713 Linear Control Theory and Design II *3 Credits*
- ME-GY 7613 Nonlinear Systems: Analysis and Control *3 Credits*
- ME-GY 7623 Cooperative Control *3 Credits*
- ME-GY 7703 Optimal Robust Control *3 Credits*

Contact Information:

Departmental Adviser: Iskender Sahin
iskender.sahin@nyu.edu

Please note that the adviser (or lead faculty in specializations) also has some latitude for approving specialty courses.

Mechanical Engineering, Energy Engineering and Policy, M.S.

Requirements for the Master of Science

Course requirements for the MS in Mechanical Engineering are suited to the applicant's specialty, which is specified by the student in the admissions process or during the first advising session. Students must take at least 21 credits out of the 30 credits needed for the degree at the NYU Tandon School of Engineering. No more than 6 credits in "Guided Reading" courses are allowed. Validation credit is not allowed, but the graduate adviser may waive specific requirements (and substitute designated ones), based upon the student's prior studies or experience. Transfer credits are not granted for:

- undergraduate courses;
- courses counted toward satisfying undergraduate degree requirements;
- courses not related to the graduate program as stated in this catalog;
- courses that received a grade lower than B.

The degree requirements are:

- ME-GY 6003 Applied Mathematics in Mechanical Engineering *3 Credits*
- ME-GY 6043 Thermal Engineering Fundamentals *3 Credits*
- ME-GY 6213 Introduction to Solid Mechanics *3 Credits*
- ME-GY 6703 Linear Control Theory and Design I *3 Credits*
- ME xxxx Required for Specialty Area (see below) *9 Credits*
- ME xxxx Electives, approved by graduate adviser *6 Credits*
- Free Elective *3 Credits*

Total: 30 Credits

Note:

If students decide to do a ME-GY 997X MS Thesis (9 credits) as part of their work for the degree, these 9 credits will be counted against 6 credits out of the 6 credits in ME Required for the Specialty Area credits and 3 credits out of the 3 credits of Free Electives. Students are not allowed to submit more than three courses (9 credits) starting with a 5 for MS degree requirements satisfaction. All courses and program details are subject to adviser approval.

Energy Engineering and Policy Specialty

Additional Required Energy Courses

- ME-GY 6813 Energy Conversion Systems *3 Credits*
- ME-GY 6823 Energy Policy, Regulations, and Incentives *3 Credits*
- ME-GY 6833 Energy Project Financing *3 Credits*

Additional Electives

Two Energy Related Electives (6 Credits) from

- ME-GY 7063 Convective Heat Transfer *3 Credits*
- ME-GY 7083 Radiative Heat Transfer *3 Credits*
- ME-GY 6153 Thermodynamics of HVAC Systems *3 Credits*
- ME-GY 6163 Fluid Mechanics for HVAC Systems *3 Credits*
- ME-GY 6173 Heat Transfer for HVAC Systems *3 Credits*
- ME-GY 6183 Design of HVAC Systems *3 Credits*

Free Elective (3 Credits)

Contact Information:

Departmental Adviser: Iskender Sahin
iskender.sahin@nyu.edu

Please note that the adviser (or lead faculty in specializations) also has some latitude for approving specialty courses.

Mechanical Engineering, Fluid Dynamics and Thermal Systems, M.S.

Requirements for the Master of Science

Course requirements for the MS in Mechanical Engineering are suited to the applicant's specialty, which is specified by the student in the admissions process or during the first advising session. Students must take at least 21 credits out of the 30 credits needed for the degree at the School of Engineering. No more than 6 credits in "Guided Reading" courses are allowed. Validation credit is not allowed, but the graduate adviser may waive specific requirements (and substitute designated ones), based upon the student's prior studies or experience. Transfer credits are not granted for:

- undergraduate courses;
- courses counted toward satisfying undergraduate degree requirements;
- courses not related to the graduate program as stated in this catalog;
- courses that received a grade lower than B.

Degree Requirements:

- ME-GY 6003 Applied Mathematics in Mechanical Engineering *3 Credits*
- ME-GY 6043 Thermal Engineering Fundamentals *3 Credits*
- ME-GY 6213 Introduction to Solid Mechanics *3 Credits*
- ME-GY 6703 Linear Control Theory and Design I *3 Credits*
- ME xxxx Required for Specialty Area (see below) *6 Credits*
- ME xxxx Electives, approved by graduate adviser *6 Credits*
- Free Electives *6 Credits*

Total: 30 Credits

Note:

If students decide to do ME-GY 997X MS Thesis in Mechanical Engineering (9 credits) as part of their work for the degree, these 9 credits will be counted against 3 credits out of the 6 credits in ME electives, 3 credits out of the 6 credits in ME Required for the Specialty Area credits and 3 credits out of the 6 credits of Free Electives. Students are not allowed to submit more than three courses (9 credits) starting with a 5 for MS degree requirements satisfaction. Departmental electives include courses with a mechanical (ME), aerospace (AE) or materials (MT) prefix, plus departmental thesis or project credits. All courses and program details are subject to adviser approval.

Fluid Dynamics And Thermal Systems Specialty

In the Fluid Dynamics and Thermal Systems area, at least two graduate courses come from the list of courses under this heading. See courses below.

- ME-GY 6153 Thermodynamics of HVAC Systems *3 Credits*
- ME-GY 6163 Fluid Mechanics for HVAC Systems *3 Credits*
- ME-GY 6173 Heat Transfer for HVAC Systems *3 Credits*
- ME-GY 6183 Design of HVAC Systems *3 Credits*
- ME-GY 7063 Convective Heat Transfer *3 Credits*

- ME-GY 7073 Conductive Heat Transfer *3 Credits*
- ME-GY 7083 Radiative Heat Transfer *3 Credits*
- ME-GY 7113 Viscous Flow and Boundary Layers *3 Credits*
- ME-GY 7133 Compressible Flow *3 Credits*
- ME-GY 7153 Computational Fluid Mechanics and Heat Transfer *3 Credits*

Contact Information:

Departmental Adviser: Iskender Sahin
iskender.sahin@nyu.edu

Please note that the adviser (or lead faculty in specializations) also has some latitude for approving specialty courses.

Mechanical Engineering, Mechanics and Structural Systems Specialty, M.S.

Requirements for the Master of Science

Course requirements for the MS in Mechanical Engineering are suited to the applicant's specialty, which is specified by the student in the admissions process or during the first advising session. Students must take at least 21 credits out of the 30 credits needed for the degree at the NYU Tandon School of Engineering. No more than 6 credits in "Guided Reading" courses are allowed. Validation credit is not allowed, but the graduate adviser may waive specific requirements (and substitute designated ones), based upon the student's prior studies or experience. Transfer credits are not granted for:

- undergraduate courses;
- courses counted toward satisfying undergraduate degree requirements;
- courses not related to the graduate program as stated in this catalog;
- courses that received a grade lower than B.

The degree requirements are:

- ME-GY 6003 Applied Mathematics in Mechanical Engineering *3 Credits*
- ME-GY 6043 Thermal Engineering Fundamentals *3 Credits*
- ME-GY 6213 Introduction to Solid Mechanics *3 Credits*
- ME-GY 6703 Linear Control Theory and Design I *3 Credits*
- ME xxxx Required for Specialty Area (see below) *6 Credits*
- ME xxxx Electives, approved by graduate adviser *6 Credits*
- Free Electives *6 Credits*

Total: 30 Credits

Note:

If students decide to do a ME 997x Master Thesis (9 credits) as part of their work for the degree, these 9 credits will be counted against 3 credits out of the 6 credits in ME electives, 3 credits out of the 6 credits in ME Required for the Specialty Area credits and 3 credits out of the 6 credits of Free Electives. Students are not allowed to submit more than three courses (9 credits) starting with a 5 for MS degree requirements satisfaction. Departmental electives include courses with a mechanical (ME), aerospace (AE) or materials (MT) prefix, plus departmental thesis or project credits. All courses and program details are subject to adviser approval.

Mechanics and Structural Systems Specialty

In the Mechanics and Structural Systems area, at least two graduate courses come from the list of courses under this heading. See courses below.

- ME-GY 5243 Composite Materials *3 Credits*
- ME-GY 5443 Vibrations *3 Credits*
- ME-GY 6213 Introduction to Solid Mechanics *3 Credits*
- ME-GY 6223 Advanced Mechanics of Materials *3 Credits*
- ME-GY 6253 Mechanics of Nanomaterials *3 Credits*
- ME-GY 6513 Advanced Dynamics *3 Credits*
- ME-GY 7213 Elasticity I *3 Credits*
- ME-GY 7243 Advanced Composite Materials *3 Credits*
- ME-GY 7323 Failure Mechanics *3 Credits*
- ME-GY 7333 Non-Destructive Evaluation (NDE) *3 Credits*
- ME-GY 7353 Fracture Mechanics *3 Credits*
- ME-GY 7443 Advanced Vibrations *3 Credits*
- ME-GY 8213 Elasticity II *3 Credits*
- ME-GY 8273 Mechanics of Cellular Materials *3 Credits*

Contact Information:

Departmental Adviser: Iskender Sahin
iskender.sahin@nyu.edu

Please note that the adviser (or lead faculty in specializations) also has some latitude for approving specialty courses.

Mechatronics and Robotics, M.S.

Requirements for the Master of Science

To complete this M.S. degree, 30 credits as specified below must be completed.

- four 3 credit core courses that will introduce students to fundamental elements of modeling, hardware, and software relevant to mechatronics and robotics
- one 3 credit course will introduce students to fundamentals of entrepreneurship and innovation to enable them to link their technical education with potential to launch businesses
- two 3 credit project courses will allow students to acquire hands-on learning and experience in integrating their coursework to create concrete illustrations of mechatronics and robotic devices (alternatively, 6 credit thesis research)
- to specialize in a focused area of mechatronics and robotics, students will select up to two 3 credit courses from a list of elective courses
- one 3 credit free elective course with advisor approval

Required Courses (15 Credits)

- ROB-GY 5103 Mechatronics *3 Credits*
- ROB-GY 6003 Foundations of Robotics *3 Credits*
- ROB-GY 6103 Advanced Mechatronics *3 Credits*
- ME-GY 6923 Simulation Tools for Robotics *3 Credits*
- MG-GY 7703 Entrepreneurship *3 Credits*

Specialty (6 Credits)

Two courses from the same specialty area must be taken from the following list to develop a specialization:

Assistive Mechatronic and Robotic Technologies

- ROB-GY 6313 Robotic Gait and Manipulation *3 Credits*
- ROB-GY 6413 Robots for Disability *3 Credits*
- ROB-GY 6423 Interactive Medical Robotics *3 Credits*

Mobile Robotics

- ROB-GY 6203 Robot Perception *3 Credits*
- ROB-GY 6213 Robot Localization and Navigation *3 Credits*
- ROB-GY 6323 Reinforcement Learning and Optimal Control for Robotics *3 Credits*
- ROB-GY 6333 Swarm Robotics *3 Credits*

Microrobotics

- ME-GY 7953 Introduction to Smart Materials and Structures *3 Credits*
- ROB-GY 6113 Microelectromechanical Sensors and Actuators for Robots *3 Credits*

Free Elective (3 Credits)

Free elective suggestions:

- MG-GY 7703 Entrepreneurship *3 Credits*
- MG-GY 7743 Advanced Trends in Technology Management and Innovation *3 Credits*
- MG-GY 7861 High-technology Entrepreneurship *1.5 Credits*
- MG-GY 7871 Intellectual Property for Technology and Information Managers *1.5 Credits*
- MG-GY 8653 Managing Technological Change and Innovation *3 Credits*

Project Courses (6 Credits)

Students must complete either two 3-credit project courses or they can enroll in one 6-credit thesis course.

Total: 30 Credits

Doctor of Philosophy

Mechanical Engineering, Ph.D.

Requirements for the Doctor of Philosophy

The PhD is a terminal degree beyond the MS and focuses on engineering research. Students are expected to advance the state of the art in their specialty by original and creative work. A MS in Mechanical or Aerospace Engineering or other closely related engineering or applied sciences fields is required for admission to the PhD degree program. A 3.5 GPA or better in the MS work is generally required for admission. In cases where it is unclear that the required MS specialization has been satisfied, the MS degree requirements of the preceding section will define the necessary reparation. The same criterion is used when the MS degree is in other engineering disciplines. Students with a BS degree in Mechanical or Aerospace Engineering and a GPA of 3.5 or better may apply directly for admission to the PhD program. Students have to take a written and oral departmental qualifying examination within the first two offerings of the exam after the date they join the doctoral program.

The general credit requirements for the PhD degree (beyond the BS degree and including MS degree credits) are:

	Credits
Transfer from MS degree	30
Approved course work beyond the MS degree	18 (minimum)
PhD Dissertation (ME-GY 999X)	21 (minimum)
Minimum total required	75 (minimum)

Studies for the PhD degree must be completed in five years after the MS degree or the date of admission, whichever is later, unless a formal leave of absence is approved before the period for which the studies are interrupted.

Once the dissertation is begun (after the student passes the PhD Qualifying Exam and forms a PhD Guidance Committee), the student must register for at least 3 credits of ME-GY 999X PhD Dissertation in Mechanical Engineering each fall and spring semester. Actual registration should reflect the pace of the work and the activity of the student. An exception to the minimum registration requirement may be made in the last semester of registration if that semester is devoted primarily to complete the work and dissertation. A dissertation grade of U for two consecutive terms affects whether a student will be permitted to continue doctoral work. Students are required to present the progress in their dissertation work to their guidance committees at least once a year.

Details on the PhD degree requirements and additional requirements can be found in the departmental pamphlet on the topic.

Contact Information:

Departmental Advisers:

Iskender Sahin, iskender.sahin@nyu.edu

Maurizio Porfiri, mporfiri@nyu.edu

Department of Technology, Culture and Society

Chair: Professor Jonathan Soffer

Mission Statement

The interdisciplinary Department of Technology, Culture and Society (TCS) promotes critical engagement with technology and science through research and teaching while drawing on humanities and social science perspectives. This mission is fulfilled in part by undergraduate degree programs, including Integrated Digital Media, B.S., Science and Technology Studies, B.S. and Sustainable Urban Environments, B.S., and by a graduate program in Integrated Digital Media, M.S. The department is also responsible for NYU Tandon's core curriculum in humanities and social sciences, which gives undergraduate students a breadth of knowledge and perspective necessary for careers in technology and the sciences.

Department: Undergrad Cluster Curriculum: Core Requirements

The Cluster Concept

TCS offers humanities and social sciences elective courses that examine the relations among science, technology and society from three general approaches and modes of inquiry: Culture, Arts and Media; Science, Technology and Society; and Society, Environment and Globalization (see below). This integrated approach to science, technology and the humanities and social sciences provides engineering and science majors with a concrete and focused foundation for their fields. The humanities and social sciences clusters are as follows:

Culture, Arts and Media (CAM)

The CAM cluster explores how cultural practices and artifacts in a wide range of media reflect, influence and interact with developments in science and technology. Courses are based on philosophy, media studies, music, literary studies, art history, rhetoric and anthropology.

Science, Technology and Society (STS)

STS cluster courses explore the interrelationships among science, technology, culture and society. The questions posed include: How do science and technology shape society? How do social processes frame scientific and technological enterprises? What is the relationship between the content of scientific and technological knowledge and the social and intellectual context in which it is created?

Society, Environment and Globalization (SEG)

Courses in this cluster address how critical areas of society, environment and globalization affect the experience of contemporary life. Coming from the complementary perspectives of the humanities and social sciences, SEG courses provide students with a broad and multicultural perspective on how environmental issues and global exchange in this "flat world" are changing society, here and across the world.

Humanities and Social Sciences Elective Requirement (4 courses, 16 credits)

Students may choose 4 courses from any humanities and social sciences cluster. These 4 electives can be within a single cluster or across multiple clusters. The department encourages students to take humanities and social sciences electives across clusters and/or across disciplines within a cluster. These 4 humanities and social sciences electives must satisfy the following constraints:

a. **At least one course must be a 3xxx/4xxx level humanities and social science elective.**
b. **At least one course must be a writing-intensive humanities and social science elective, labeled by "W."**

Course Types

TCS offers three types of undergraduate courses, as well as graduate courses:

Humanities and Social Sciences Electives are open to all Bachelor of Science students, subject to prerequisites. They count toward the school's general-education requirement and the state's Liberal Arts and Science requirement and help meet ABET requirements.

Writing-Intensive Humanities and Social Sciences Electives are writing-intensive humanities and social sciences courses designated with a "W" and open to all Bachelor of Science students, subject to prerequisites. Requirements for writing-intensive courses include:

i. A minimum of 15 pages of formal writing, not including informal writing and in-class exams;
ii. Explicit writing instruction;
iii. At least one formal written assignment that incorporates instructor response and student revision;
iv. As part of the writing-intensive course, students will learn to write a formal research paper related to the class topic.

Studio Electives are creative practice courses in art and design disciplines, open to all Bachelor of Science students, subject to prerequisites. These courses may NOT be taken as humanities and social sciences electives to satisfy general-education humanities and social sciences requirements, but may be taken as technical or free electives.

N.B.: Courses that carry the following prefix may NOT be used to fulfill the general humanities and social sciences requirements: DM (digital media).

Institutes Affiliated with the Department of Technology, Culture and Society

Brooklyn Experimental Media Garage (BxmC)

BXmC at NYU SOE is truly experimental; it is the creative/research arm of the School of Engineering's art and technology programs. BXmC works with the hard core of New York's experimental multimedia scene: installation and performing artists, programmers and interaction designers and architects. BXmC develops new kinds of partnerships to create new applications of digital media technologies, including web, sound, film, 3-D, games and others.

Contact Information

NYU Tandon School of Engineering
Six MetroTech Center
Brooklyn, NY 11201
Tel: (646) 997-3231
http://engineering.nyu.edu/academics/departments/tcs

Degrees Offered

Bachelor of Science

- Integrated Digital Media, B.S. based in the Integrated Digital Media Program
- Science and Technology Studies, B.S. based in the Science and Technology Studies Program
- Sustainable Urban Environments, B.S. based in the Sustainable Urban Environments Program

Master of Science

- Integrated Digital Media, M.S. offered by the Integrated Digital Media Program

Minors

Integrated Digital Media

Requirements: 15 credits of DM courses, of which 6 are at the 3xxx level or above.

Feminism and Science, Technology, Engineering and Math (FSTEM)

The minor consists of 16 credits, or 4 courses, offered by the TCS department. There is 1 required course, STS-UY 2284 Introduction to FSTEM. The other 3 courses (12 credits) may be chosen from the list of approved courses for this minor.

Science and Technology Studies

The minor in STS requires 16 credits consisting of:

1. Core requirement: STS-UY 3004W (4 credits).
2. Elective requirement: Remaining credit requirements (12 credits) must be satisfied by courses chosen from the STS electives list.

Requirement 1 and one of the STS electives (requirement 2) must be taken at SOE; the remaining elective requirements may be met with transfer credits.

Sustainable Urban Environments

The minor in SUE requires 16 credits consisting of at least two courses from the SUE core and three courses from any of those offered in the concentration. The minor in SUE is open to all majors.

English Minor for Tandon Students

Tandon students may earn a minor in English under an arrangement between NYU Tandon's Technology, Culture, and Society Department and NYU's College of Arts and Sciences English Department. This minor is especially designed for Tandon students to allow for the particular demands of completing a Tandon degree. It should be noted that the requirements for the Tandon English minor are different from those of a CAS English minor.

This is a five-course (20-point) minor. The requirements, all to be completed with a grade of C or better, are:

- One second-semester EWP course
- Three Tandon EN or CAS ENGL-UA courses
- ENGL-UA 101: Introduction to the Study of Literature

Those who wish to declare a Tandon English minor must do so through the CAS English department: https://drive.google.com/file/d/1as2_ZAndOu1z_1vB5_5ZEsq181SE4ctw/view?usp=sharing.

Faculty

Professors

Kristen Day, Professor of Technology, Culture and Society
PhD, University of Wisconsin, Milwaukee
Urban Design and Behavior; Design of Urban Environments for Equity, Health and Well-being

Jean Gallagher, Professor of English
PhD, City University of New York Graduate Center
Feminist theory, 19th- and 20th-century American literature, modern poetry

Sylvia Kasey Marks, Professor of English
PhD, Princeton University
Literature and ethical questions, the environment, medicine, and the city; the 18th- and 19th- century British novel and other fiction; Shakespeare; drama; expository writing; public speaking

Oded Nov
PhD, Cambridge University
Human-Computer Interaction, Citizen Science

Beth Simone Noveck, Professor of Governance
PhD, University of Innsbruck
JD, Yale University
Digital Government, Techology & Democracy

Jonathan Soffer, Professor of History and Department Chair
PhD, Columbia University
JD, University of Denver
Twentieth-century American political and foreign-relations history, urban history with a specialization in the history of New York City since 1945

Associate Professors

Amy Hurst, Associate Professor of Human-Computer Interaction
PhD, Carnegie Mellon University
Accessibility Research

Jonathan Bain, Associate Professor of Philosophy of Science
PhD, University of Pittsburgh
Quantum Theory, Philosophy of Space and Time

Anne-Laure Fayard, Associate Professor of Management
PhD, Ecole des Hautes-Etudes en Sciences Sociales
Sociomaterial Practices, Service Design

Teresa Feroli, Associate Professor of English
PhD, Cornell University
Renaissance Literature, Shakespeare, Women's Studies

Assistant Professor

Luke Dubois, Assistant Professor of Integrated Digital Media
PhD, Columbia University
Computer Music, Real-Time Multimedia

Elizabeth Marie Hénaff Assistant Professor of Integrated Digital Media
PhD, University of Barcelona
Biodesign, Genomics, Media & Art, Urban Biome Citizen Science

Industry Faculty

Ahmed Ansari, Industry Assistant Professor of Integrated Digital Media
PhD, Carnegie Mellon University
Design Studies, Critcal Cultural Studies, Philosophy and History of Technology

Tega Brain, Industry Assistant Professor of Integrated Digital Media
Master of Art (research) Creative Industries, Queensland University of Technology
Interaction Design, Environmenal Art and Deisgn, Citizen Science, Art and Engineering

Carla Gannis, Industry Professor of Integrated Digital Media
MFA, Boston University
Networked Communication, Art & Literary History, Emerging Technologies, Speculative Fiction

Regine Gilbert, Industry Assistant Professor of Integrated Digital Media
MS, University of Phoenix
Digital Accessibility Inclusive Design, Immersive Experiences

Danya Glabau, Industry Assistant Professor of Science & Technology Studies
PhD, Cornell University
Patient Activism, The Medical Economy

De Angela Duff, Industry Professor of Integrated Digital Media
MFA, Maryland Institute College of Art
Web Design, Interaction Design

Kadija Ferryman, Industry Assistant Professor of Anthropology
PhD, The New School
Social, Cultural, and Ethical Implications of Health Information Technologies

Scott Fitzgerald, Industry Professor of Integrated Digital Media
MPS, New York University
Web Design, Interaction Design

Kathleen McDermott, Industry Assistant Professor of Integrated Digital Media
PhD Candidate, Rensselaer Polytechnic Institute
Media Arts, Technology Design

Benedetta Piantella, Industry Associate Professor of Integrated Digital Media
MPS, New York University
Interaction Design, Technology in the Developing World

Mark Skwarek, Industry Associate Professor of Integrated Digital Media
MFA, Rhode Island School of Design
Augmented Reality

Lecturers

Donald S. Phillips, Senior Lecturer in Natural History
BS, Polytechnic University
Physical Anthropology, Paleontology, Natural Disasters

Allan Goldstein, Senior Lecturer in English
BA, University of Denver
Writing Nonfiction/Personal Experience Writing, Disability Studies

James P. Lewis, Senior Lecturer in Psychology
MA, Stony Brook University
Humanistic Psychology

Alan M. Nadler, Senior Lecturer in English
MFA, Columbia University
Contemporary Poetry, The European Novel

Associated Faculty

Victòria Alsina Burgués, Industry Associate Professor & CUSP Academic Director

Research Faculty & Staff

Mariela Alfonzo, Research Assistant Professor

Kate Crawford, Distinguished Research Professor

Anirudh Dinesh, Research Scientist

Meredith Whittaker, Distinguished Research Scientist

Faculty Emeriti

- Lester Bumas
- Duane DeVries
- Anne Eisenberg
- Helmut Gruber
- Louis Menashe
- David Mermelstein
- F. David Mulcahy
- Bernard Rechtschaffen

- Thomas B. Settle
- Harold P. Sjursen
- Romualdas Sviedrys
- Rich
  Wener

Humanities and Social Sciences Electives List

Humanities and Social Sciences Electives List

Non-Degree

English Minor for Tandon Students

Tandon students may earn a minor in English under an arrangement between NYU Tandon's Technology, Culture, and Society Department and NYU's College of Arts and Sciences English Department. This minor is especially designed for Tandon students to allow for the particular demands of completing a Tandon degree. It should be noted that the requirements for the Tandon English minor are different from those of a CAS English minor.

Students must declare their intent to pursue the Tandon English minor with the CAS English Department so that the minor will be recorded on their Albert transcript. Complete the declaration form on this link: https://drive.google.com/file/d/1as2_ZAndOu1z_1vB5_5ZEsq181SE4ctw/view?usp=sharing

Send or deliver it to Mary Mezzano, mm8370@nyu.edu, CAS English Department: 244 Greene Street, Washington Square

For more information, students may consult the following links:

- Tandon TCS website: https://engineering.nyu.edu/academics/departments/technology-culture-and-society
- CAS English Department: http://as.nyu.edu/english/undergraduate/program-of-study-cas-bulletin.html

Requirements are five courses all to be completed with a grade of C or better:

- The second-semester Expository Writing course, The Advanced College Essay, EXPOS-UA 2
- Three English literature electives from Tandon or CAS with the prefixes EN-UY or ENGL-UA
- The CAS Introduction to the Study of Literature course, ENGL-UA 101

Feminism and Science, Technology, Engineering and Math (FSTEM) Minor

The Feminism and Science, Technology, Engineering and Math (FSTEM) minor trains students to have a critical understanding of the ways that difference and diversity, including gender, race, nationality, class, and ability, shape and are shaped by modern science and technology. Courses for the minor introduce students to the history of women in STEM, the construction of scientific theories of gender and racial difference, queer theory, designing for diversity, and the relationship between gender and disability. Feminist and other student-centered pedagogies encourage students to connect course content to the real world through in-class activities, independent research, writing assignments, engagement with community organizations, and design briefs.

In contemporary STEM fields, professionals must be equipped with the knowledge and tools to identify and decrease bias and unfairness in the design of technical systems, like AI and large-scale infrastructure projects. This minor, open to all Tandon students, prepares students to face these challenges head on and change the world for the better.

The minor consists of 16 credits, or 4 courses, offered by the TCS department. There is 1 required course, Introduction to FSTEM. The other 3 should be chosen from the list below.

Curriculum

Required Course

- STS-UY 2284 Introduction to FSTEM *4 Credits*

List of Approved Courses

- CAM-UY 2204 Disability Studies *4 Credits*
- STS-UY 2224 Science and Sexuality *4 Credits*
- STS-UY 2334 The Invention of Race *4 Credits*
- STS-UY 2904 Special Topic in STS *4 Credits* (Diversity in Technology*)*
- STS-UY 3204 Science and Difference *4 Credits*
- STS-UY 3214 Science & Feminism *4 Credits*
- STS-UY 3224 Queering Science and Technology *4 Credits*
- DM-UY 9103 Special Topics in Digital Media: Designing the PostNatural
- DM-GY 9103 Special Topics in Digital Media: Designing 'Other' Worlds
- DM-UY 9103 Special Topics in Digital Media: Critical Wearables
- DM-UY 9103 Special Topics in Digital Media: Living With Robots

Doctor of Philosophy

Technology, Culture and Society Ph.D.

Degree Requirements and Curriculum

The curriculum for the Ph.D. in Technology, Culture and Society Program fosters a research-intensive doctoral education relevant to understanding and shaping the impact of new technologies on a complex and rapidly-changing society and its institutions. We focus on how technology impacts society and culture and how, in turn, society and its institutions respond to those impacts. This includes the rapidly emerging areas of integrated design media, human-computer interaction, institutional innovation, data science and urban analytics. TCS core courses provide a necessary foundation to develop these advanced skills.

Coursework for the Ph.D. in Technology, Culture, and Society expose students to advanced design skills modulated by understanding of the ways in which society and technology deeply influence design and development. Research methods courses help students develop advanced qualitative and quantitative research skills in the social sciences, as a basis for designing, making, and evaluating new technologies in the service of society. Thematic elective courses help students gain in-depth knowledge in a focused thematic area related to designing and making in domains including Human-Computer Interaction, disability, media, and governance based on grassroots input, as well as a deep intersectional understanding of the interplay between technology, race, class, gender, and ability. Working together, students and doctoral advisers select which courses relate to the student's course of study in the Program.

Students are required to complete 75 credits, including 51 credits from the course work and 24 credits from the dissertation.

1. Research Methods Courses: 9 Credits

- MG-GY 9413 Quantitative Methods Seminar I *3 Credits*
- MG-GY 9433 Qualitative Research Methods *3 Credits*
- Methodology course related to student's plan of study (requires advisor and program director approval)

2. TCS Courses: 15 Credits

Students will have the opportunity to hone their specialization through selecting TCS courses relevant to their research interests. Students should consult with their research advisor and select 5 appropriate classes).

- Can be in any subfield(s)
- At least 3 courses must be offered through TCS department

3. Doctoral Seminar (12 Credits)

Students are required to take four 3-credit doctoral seminar courses to provide strong research background required for doctoral studies. These four research seminars should be completed before taking the comprehensive exam.

DM-GY Doctoral Seminar in Technology, Culture and Society

4. Independent Research Project: 15 Credits

Students will build their research experience through independent study courses where they will conduct research under a faculty member. Students must complete at least 15 credits of this course before registering for their dissertation, and enroll with at least two different TCS faculty.

- MG-GY 9913 Independent Research *3 Credits*

5. Doctoral Dissertation: 24 credits

The dissertation is evaluated in two parts: Proposal Defense and Final Defense. For details, contact the Ph.D.-TCS Program academic director.

- MG-GY 999X PhD Dissertation in Technology Management *3 Credits*

6. Comprehensive Examinations

Students must successfully pass two comprehensive examinations before starting the dissertation.

- Part One: This examination includes material covered in the methodology courses. It can be taken after completing 30 graduate credits.

- Part Two: This examination includes material from the thematic elective and associated thematic research courses, doctoral seminars and research methods courses. It can be taken after completing required course work.

Students can take both examinations together. Results are provided within one month of the examination. Students have only two chances to pass each examination, and we recommend they start during the end of their 2nd year.

7. Research training and interaction with faculty

Students are expected to work actively with one or more faculty each year, and focus on completing research. Students are strongly encouraged to present research in progress once a year and work towards publishable papers, usually with a faculty as co-author.

Every student participates in formal research seminars with departmental faculty and visitors.

8. Advising and evaluating

The TCS doctoral program faculty director advises all first-year doctoral students. During their first year students have many opportunities to get to know the research interests of all departmental faculty. By the beginning of the second year, students have selected an intermediary adviser who will guide them through the comprehensive exam process and up to the thesis stage. By the middle of the third year students will have selected a thesis adviser. Each year every student submits a statement of intellectual progress to their adviser.

All faculty meet to review the progress of all students in a day-long meeting each year. At this time, the student's intellectual progress is reviewed and plans for the following year are considered. The results of this review include a formal letter to the student assessing the previous year's work and offering guidance for the following year's work.

9. Prerequisites

All PhD-TCS students need a fundamental knowledge of probability and statistics. Students without such a background must take MG-GY 5050 Probability and Managerial Statistics. Students without any background in professional writing and communications must take JW-GY 6003 Introduction to Technical Communication or JW 6313 Proposal Writing.

Students who have a master's degree or who are transferring from other institutions (or other departments within Tandon) are admitted based on the same qualification standards that apply to new students. For each required MS- or PhD-level course, if students have taken a similar course, they may transfer credits for the course. However, students still have to take and pass both qualifying exams. A minimum of 30 credits, including all dissertation credit, must be taken at Tandon. No dissertation credits from other institutions can be transferred.

All students must take the required coursework as assigned and follow the stipulated curriculum. The course work must be finished within the first three years and the dissertation thesis within the next three years, so all students complete the doctorate within six years.

Total Credits for PhD-TCS Program: 75

Integrated Digital Media

Academic Advisors: Eric Maiello, Kazi Rahman, and Jenelle Woodrup

Mission

How does NYU Tandon define "integrated" digital media? As a synthesis of cutting-edge technology, creative mastery and critical thinking. NYU Tandon has long been at the forefront of developments in education and research and in computing, telecommunications, imaging sciences and the Internet. We maintain close ties to New York's mediarelated industries and leaders. Faculty members bring to their academic and research programs a practical, real-world perspective.

NYU Tandon offers Bachelor of Science and Master of Science programs in Integrated Digital Media. These programs use NYU Tandon's extensive resources to unite the traditionally separate dimensions of creation, critical analysis and technology development. NYU Tandon's location offers access to a rich mix of digital-media leaders-artists, academics, designers, developers, producers and engineers.

NYU Tandon programs allow students to develop mastery not only of technique, but also of concepts and context. To achieve this synthesis without compromising quality or depth, NYU Tandon offers (and requires) an exceptional level of commitment leading to an exceptionally desirable credential in industry and culture. These programs provide a full understanding of all aspects of media invention, production and distribution. NYU Tandon prepares graduates for their first entry-level position or proof of- concept, and also for a future in which they can rise within existing institutions, genres and companies, or confidently build new ones.

Brooklyn Experimental Media Center (BxmC)

The Brooklyn Experimental Media Center provides a point of contact between top-level investigators in technological, creative and strategic areas across the academic, civil and private sectors. A program of exhibitions, performances and demonstrations showcase the best in the field at one of digital media's epicenters: New York City. The center also hosts visiting scholars and artists and collaborates with partner institutions to develop interdisciplinary projects and exchange programs. BxmC provides a vehicle for strong working relationships within NYU Tandon (music, humanities, computer science, electrical engineering), NYU (Courant Institute's Media Research Lab, the Steinhardt Music Technology program, the Tisch School's Game Center and Interactive Telecommunication program) and a global network of fascinating people.

Facilities

NYU Tandon's new integrated digital media labs in MAGNET (2 MetroTech) provide access to state-of-the-art audio, video, web and multimedia tools for studio and field production. Individual students and small teams are organized to produce professional work under the direct supervision of senior faculty. Where pertinent, leaders in allied professions work handson with students and faculty. The 344-seat Pfizer auditorium is available for special projects and public events organized by faculty, students or guests. The control room and excellent acoustics offer a broad range of technical setups. The Polytechnic Hall of Fame, a nine-screen multimedia venue with 5.1 sound system, can be used as a development environment or public space for special projects. The sound studio is a continuing development project, enabling everything from podcasting, mixing and mastering to ambisonic sound-installation projects.

The labs offer digital video and audio production and postproduction, 2D and 3D interactive design and programming, web, single and multiplayer game development and experimental interfaces. NYU Tandon partners with other institutions and firms to provide access to professional television and radio production environments, multimedia facilities and specialized communications facilities-as required for specific projects. In keeping with the industry's creative side, NYU Tandon digital media labs are Mac-based. Facility development is continuous. Linux and Windows facilities are available. NYU Tandon also uses and supports open-source tools and practices where they are most effective.

Faculty

NYU Tandon faculty and technical staff, with their diverse backgrounds, offer a complete range of expertise in digital media from television production to database programming, from the principles of audio filters to the art of interface design. All technical work is grounded in first-class science and engineering and backed by NYU Tandon's strong history as a center of technological research, development and innovation. The Department of Technology, Culture and Society offers further resources in areas such as the history and philosophy of science and technology, as well as experts in behavioral psychology, environmental studies and music theory. The permanent faculty is supplemented by visiting instructors and a program of guest speakers. Students can find opportunities to work with scholars and creators in residence on projects selected for their relevance to a student's program of study.

Students

The program unites students with the right mix of educational and professional backgrounds and helps them capitalize on their own and each other's expertise and initiative. This approach reflects the working reality of the best in digital media: small interdisciplinary teams of people with complementary skills working together on exciting projects with tight deadlines. No one person can expect to combine all the necessary skills (or do all the work), so the program looks for people who already have demonstrated proficiency in one or more areas and who are team players.

Eligibility

Candidates for the Bachelor of Science program are subject to NYU Tandon's general-admissions procedures and standards.

All candidates for the Master of Science program are selected for their demonstrated ability and motivation. From the best applicants, the program selects a group with a mix of experience and skills to maximize opportunities for the kind of teamwork and learning characteristic of media professions. A bachelor's degree or equivalent is required. NYU Tandon does not require GRE scores but will admit applicants based on an interview and review of previous work.

Contact

Eric Maiello, Administrative Director
Integrated Digital Media Program
NYU Tandon School of Engineering
Six MetroTech Center
Brooklyn NY 11201
em1680@nyu.edu
(646) 997-0720

Further Information:
http://engineering.nyu.edu/academics/programs/integrated-digital-media-bs

Programs

Bachelor of Science Program

Candidates for a Bachelor of Science in Integrated Digital Media are required to complete DM Core Courses (minimum 42 credits), free electives (18 credits), Math and Science Courses (15 credits) and NYU Tandon's general-education requirements in the Humanities and Sciences (45 credits, including restricted electives) for a total of 120 credits over four years. The electives may be taken as supplementary studio courses or toward a minor in any subject at NYU Tandon, subject to course prerequisites and the approval of the host department.

NYU Tandon encourages students to maximize the use of its full range of disciplines and to develop the best combination of knowledge and skills for their careers. This approach helps students to choose careers with awareness of their abilities and interests. Students should carefully choose foundation courses and electives so that they have the right prerequisites for specific upper-level courses, especially in science and technology. For detailed current information about available options and requirements, students should contact a program adviser who will consult with faculty in the host departments.

All DM courses are offered as Studio Seminars. Students will be expected to produce finished projects of professional quality under the guidance of active digitalmedia practitioners who are informed by a powerful understanding of the creative and critical context of their work. While NYU Tandon provides top-quality equipment and facilities, students will be expected to obtain and maintain their own laptop computer (consult the department for current specifications) as well as basic peripherals and consumables. In general, digital-media production calls for teamwork and a willingness to produce innovative, high-quality work.

The Bachelor of Science program in Integrated Digital Media provides a foundation for professionals and for those preparing for postgraduate study in particular by flowing into the Master of Science program. With planning and hard work, students can complete a BS (120 credits) and MS (30 credits) in five years.

Master of Science

The Master of Science Program in Integrated Digital Media provides students the tools, skills and insight to craft a better future. Whether undertaken as the beginning of a career in academic research, industry or service, a MS must provide mastery of a particular discipline with a broad understanding of the long-term patterns and tendencies of society and culture. As the reach and impact of new technologies increases, so must the wisdom of those who decide on their use.

The MS in Integrated Digital Media is the best preparation for a rewarding future in the rapidly expanding field of digital-media communications across a wide spectrum of interests. These interests include creative experience, an understanding of the broad forces shaping communications technologies and society and the people's ability to use what they know and imagine. Individual students and small teams directed by senior faculty are organized to produce professional work. Where relevant, leaders in allied professions work hands-on with students and faculty, including faculty from other departments at NYU Tandon or elsewhere in New York City.

The Master of Science in Integrated Digital Media is full-time and intensive: three consecutive semesters including a major creative/research thesis project. This program requires complete commitment for a manageable time span from "literate practitioners" prepared to make the most of their personal resources. The formal course requirement of 30 credit hours, includes a 6-credit thesis project (considerable out-of-class work commitment is expected).

The curriculum combines hands-on production work with a study of historical, legal and philosophical aspects of digital-media communications. Guest scholars and conferences supplement the regular program and maximize personal contact with leaders in various fields: business, advocacy, service, entertainment and education. The production side emphasizes developing skills that apply to a broad spectrum of media and mandates: small groups working on specific projects focusing on content-driven design and planning and creation. NYU Tandon's facilities and s trategies use top-of-the line portable equipment rather than capital-intensive studio setups. This approach makes it practical for labs to offer up-to-the-minute technology and for students to prepare for freelance work and their own start-ups, as well as for work in the corporate and public sectors.

Non-Degree

Integrated Digital Media Minor

The minor in Integrated Digital Media is intended for students interested in developing their knowledge and practical skills in and around digital media production technology. As with the BS degree in Integrated Digital Media, courses provide theoretical context and also teach hands-on production expertise in various areas, such as digital filmmaking, web design, 3D graphics, game design, and digital audio. This minor is valuable for students who want to seize their own means of production in their primary fields, allowing them to design, create, and publish media content within the intellectual context of digital media in the 21st century.

Structure of the Minor

The IDM minor requires a minimum of 15 credits in DM classes:

- 3 credits in Audio or Visual Foundation Studio
- 12 credits of DM courses at the 1/2/3/4XXX level

Minor Coursework

- DM-UY 1113 Audio Foundation Studio *3 Credits*
- DM-UY 1123 Visual Foundation Studio *3 Credits*
- DM-UY 1133 Creative Coding *3 Credits*
- DM-UY 1143 Ideation & Prototyping *3 Credits*
- DM-UY 2113 Sound Design for Media *3 Credits*
- DM-UY 2123 Narrative Cinema *3 Credits*
- DM-UY 2133 3D Modeling *3 Credits*
- DM-UY 2143 Interaction Design Studio *3 Credits*
- DM-UY 2153 Intro to Game Development *3 Credits*
- DM-UY 2213 User Experience Design (UX) *3 Credits*
- DM-UY 2263 Still and Moving Images *3 Credits*
- DM-UY 2173 Motion Graphics Studio *3 Credits*
- DM-UY 2183 Contemporary Techniques in Digital Photography and Imaging *3 Credits*
- DM-UY 2193 Intro to Web Development *3 Credits*
- DM-UY 3113 Contemporary Techniques in Sound Art *3 Credits*
- DM-UY 3123 Documentary Cinema *3 Credits*
- DM-UY 3133 3D Animation *3 Credits*
- DM-UY 3153 Media in Game Design and Development *3 Credits*
- DM-UY 3183 Photography and Words *3 Credits*
- DM-UY 3193 Dynamic Web Applications *3 Credits*
- DM-UY 4123 Experimental Cinema *3 Credits*
- DM-UY 4133 3D for Interactive Applications *3 Credits*
- DM-UY 4153 Experimental Game Narratives *3 Credits*
- DM-UY 4173 Professional Practices for Creatives *3 Credits*
- DM-UY 4193 Mobile Application Development *3 Credits*

Contact Information:

Departmental Adviser: Eric Maiello

eric.maiello@nyu.edu

Bachelor of Science

Integrated Digital Media, B.S.

Bachelor of Science Degree Requirements

Digital Media Core: 42 Credits

- DM-UY 1113 Audio Foundation Studio *3 Credits*
- DM-UY 1123 Visual Foundation Studio *3 Credits*
- DM-UY 1133 Creative Coding *3 Credits*
- DM-UY 1143 Ideation & Prototyping *3 Credits*
- DM-UY 2193 Intro to Web Development *3 Credits*
- DM-UY 2263 Still and Moving Images *3 Credits*
- DM-UY 4003 Senior Project in Digital Media *3 Credits*
- DM-UY 4173 Professional Practices for Creatives *3 Credits*
- DM-UY 2/3/4XXX DM Studio Electives *18 Credits*
  or
- DM-UY 2/3/4XXX DM Studio Electives 15 credits and DM-UY 4034 Internship 4 credits

Math, Science, Humanities, and Social Sciences: 60 Credits

- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- Humanities/Math/Natural Science Electives *25 Credits*
- MA-UY 2414 Basic Practice of Statistics *4 Credits* (or equivalent) **or** MA-UY 1024 Calculus I for Engineers (or equivalent)
- MCC-UE 0001 Introduction to Media Studies *4 Credits* **or** MCC-UE 0003 History of Media and Communication *4 Credits*
- MD-UY 2314 Interactive Narrative *4 Credits*
- PH-UY 1213 Motion and Sound *3 Credits*
- PH-UY 1223 Electricity and Light *3 Credits*
  Select one course from either of the following fields of studies with the EXCEPTION of MCC-UE 1029 New Media Research Studio; MCC-UE 1031 Digital Media Theory and Practice; MCC-UE 1585 Creative Coding.
- Technology and Society
- Interaction and Social Processes
  4 Credits

Free Electives: 18 Credits

Total: 120 Credits

Typical Course of Study for the Bachelor of Science in Integrated Digital Media (POSSIBLE OUTLINE)

Freshman Year

Fall Semester: 14 Credits

- DM-UY 1123 Visual Foundation Studio *3 Credits*
- DM-UY 1133 Creative Coding *3 Credits*
- DM-UY 1143 Ideation & Prototyping *3 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*

Spring Semester: 16 Credits

- DM-UY 1113 Audio Foundation Studio *3 Credits*
- DM-UY 2193 Intro to Web Development *3 Credits*
- DM-UY 2263 Still and Moving Images *3 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- PH-UY 1213 Motion and Sound *3 Credits*

Sophomore Year

Fall Semester: 18 Credits

- PH-UY 1223 Electricity and Light *3 Credits*
- Math, Science, Humanities Elective *4 Credit*s
- Math, Science, Humanities Elective *4 Credit*s
- DM 2/3/4xxx DM Studio Elective 3 *Credits*
- MCC-UE 0001 Introduction to Media Studies *4 Credits* **or** MCC-UE 0003 History of Media and Communication *4 Credits*

Spring Semester: 18 Credits

- DM 2/3/4xxx DM Studio Elective *3 Credits*
- DM 2/3/4xxx DM Studio Elective *3 Credits*
- MD-UY 2314 Interactive Narrative *4 Credits*
- MA-UY 2414 Basic Practice of Statistics *4 Credits* (or equivalent) **or** MA-UY 1024 Calculus I for Engineers (or equivalent)
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*

Junior Year

Fall Semester: 14 Credits

- DM 2/3/4xxx DM Studio Electives *3 Credits*
- Math, Science, Humanities Elective *3 Credits*
- Math, Science, Humanities Elective *4 Credits*
- Free Elective *4 Credits*

Spring Semester: 15 Credits

- DM 2/3/4xxx DM Studio Electives *3 Credits* **or** DM-UY 4033 Internship *3 Credits*
- Math, Science, Humanities Elective *4 Credits*
- Free Elective *4 Credits*
- Select one course from either of the following fields of studies with the EXCEPTION of MCC-UE 1029 New Media Research Studio; MCC-UE 1031 Digital Media Theory and Practice; MCC-UE 1585 Creative Coding. *4 Credits*
    1. Technology and Society
    2. Interaction and Social Processes

*http://steinhardt.nyu.edu/mcc/undergraduate/fields_of_study

Senior Year

Fall Semester: 14 Credits

- DM-UY 4173 Professional Practices for Creatives *3 Credits*
- DM 2/3/4xxx DM Studio Electives *3 Credits*
- Math, Science, Humanities Elective *4 Credits*
- Free Elective *4 Credits*

Spring Semester: 15 Credits

- DM-UY 4003 Senior Project in Digital Media *3 Credits*
- Math, Science, Humanities Elective *4 Credits*
- Free Elective *4 Credits*
- Free Elective *4 Credits*

Total: 120 Credits

Master of Science

Integrated Digital Media, M.S.

Degree Requirements for the Master of Science

Students must complete 30 credits in a minimum of three semesters, but no more than ten to obtain a Master of Science in Integrated Digital Media. Students typically take a four course load (3 credits per course) in the fall and spring of their first year. Students must enroll in MS Pre-Thesis and MS Thesis in their final two consecutive semesters (not simultaneously). Below is the distribution of credit requirements.

Typical Course of Study for the Master of Science in Integrated Digital Media (POSSIBLE OUTLINE)

IDM admits starting their degree in the Fall semester will start in-person/on campus.

First Semester, Fall

- DM-GY 6053 Ideation & Prototyping *3 Credits*
- DM-GY 6063 Creative Coding *3 Credits*
  Elective
- DM-GY 9990 Graduate Colloquium *0 Credits*

Second Semester, Spring

- DM-GY 6043 Theories and Cultural Impact of Media & Technology *3 Credits*
  Elective
  Elective
- DM-GY 9990 Graduate Colloquium *0 Credits*

Third Semester, Fall

- DM-GY 7033 Media Law *3 Credits*
- DM-GY 9990 Graduate Colloquium *0 Credits*
- DM-GY 9963 MS Pre-Thesis in Digital Media: Research Methods *3 Credits*
  Elective

Fourth Semester, Spring

- DM-GY 997X MS Thesis in Integrated Digital Media *3-6 Credits*
- DM-GY 9990 Graduate Colloquium *0 Credits*

If beginning in a Spring Term (POSSIBLE OUTLINE):

IDM admits starting their degree in the Spring semester will start online.

First Semester, Spring

- DM-GY 6063 Creative Coding *3 Credits*

- DM-GY 6053 Ideation & Prototyping *3 Credits*
- Elective

Second Semester, Fall

- DM-GY 6043 Theories and Cultural Impact of Media & Technology *3 Credits*
  Elective
  Elective

Third Semester, Spring

- DM-GY 7033 Media Law *3 Credits*
- DM-GY 9963 MS Pre-Thesis in Digital Media: Research Methods *3 Credits*
  Elective

Fourth Semester, Fall

- DM-GY 997X MS Thesis in Integrated Digital Media *3-6 Credits*

Science and Technology Studies

Program Director: Amber Benezra
Program Adviser: James Lewis

General Information

Rapidly changing technology requires science and engineering students and professionals to keep abreast of the latest discoveries and innovations in their fields. It is also important for scientists and engineers, as well as an informed public, to see new knowledge in a larger context-that is, to be able to recognize and understand how these advances influence everyday life and, in turn, how the influence of society leads to these developments. Embryonic stem cell research, intellectual property and human genetics, the thrust towards alternative energies, and the rise of digital entertainment are just a few of the latest examples of how science and technology interact with society. Throughout history, scientific and technological innovations have had ethical, economic, social, and political impacts.

Science and Technology Studies (STS) is an interdisciplinary field of study committed to exploring the interrelationships between science and technology on the one hand, and society on the other. STS unites a myriad of disciplines, such as history, philosophy, rhetoric, literary studies, and sociology, to investigate these interrelationships. How do science and technology shape society? How do social processes frame scientific and technological enterprises? What is the relationship between the content of scientific and technological knowledge, and the social and intellectual context in which it is created?

The STS program at NYU Tandon is characterized by its collegiality and its focus on interdisciplinary collaboration with other degree programs. An STS graduate bears the distinctive marks of all three parts of an NYU Tandon degree: top-notch education in a scientific or technical field, a comprehensive foundation in the humanities, and an awareness of the synergies between science, technology, and society.

At NYU Tandon, STS Majors Study Topics such as:

Biology and Genetics

The fields of biotechnology and genetic engineering raise significant scientific and ethical issues in the areas of new pharmaceuticals, cloning, stem cell research, genetic privacy, and the patenting of human genes. STS students approach these topics from a broad perspective, understanding both the scientific and philosophical issues arising in these important fields so that they can be capable advisers of public policy and thoughtful innovators in the new rounds of scientific inquiry.

The History of Science and Technology

The Scientific Revolution significantly altered humankind's conception of itself and the universe. Scholastic methods of reasoning were replaced by new scientific methods of observation and experimentation as evidenced by Galileo's telescope. New tensions arose between religion and science: who had the power to interpret God's universe, philosophers or theologians? STS students study these important events to help understand current scientific controversies and directions.

History and Philosophy of Physics

The field of physics plays an important role in our scientific and technological understanding of the world. What do the fundamental theories in physics really tell us about the world? What is the relationship between the mathematical descriptions that physicists employ and the nature of physical phenomena such as matter and forces, space and time? STS students obtain firm foundations in both philosophy and physics to consider these and other questions related to the role physics plays in both science and technology.

The History of Media Technology

An STS approach to the history of media considers media as specific, technological devices. STS students study such topics as the diffusion of Internet technologies across international borders during the latter part of the 20^{th} century, the history of the dialogue between such technologies and their cultural and physical environments, and the on-going evolution of their interaction with national systems of laws, politics, and economics.

Program Highlights

The Resources of New York City's Preeminent Technological Institution

What better place to study the relations among science, technology, and society than in New York City, the most culturally and socially diverse, technology-driven urban center in the world? In addition, STS majors take full advantage of the course offerings of the second-oldest engineering research institute in the country as well as the computing and research facilities associated with a premier leader in technology innovation.

The Technology/Science Requirement

STS majors fulfill a tech/sci requirement that is the equivalent of a minor in a particular field of technology or science, with significant exposure to other fields. Tech/Sci offerings include courses in multi-disciplinary subjects such as nanotechnology, robotics, and computer game design, as well as more traditional subjects in engineering and the natural sciences.

Faculty Mentors

Each STS major is assigned a faculty mentor who provides assistance in choosing electives, constructing the tech/sci minor, and designing and implementing project courses.

Project-Oriented Education and Research

STS majors may elect to undertake a project oriented semester studying abroad or engaged in an internship. In addition, students may undertake Directed Studies projects during their time at NYU Tandon. All STS majors must complete a senior Capstone Project. These requirements and opportunities provide students with essential experience in conducting and presenting research at public forums within the School.

Career Tracks

Their training in both tech/sci and the liberal arts allows STS graduates to pursue:

- Medical school, law school, or business school.
- Technology consultants at consulting firms.
- Technology equity analysts at investment institutions.
- Science journalists or science educators.
- Science and technology policy administrators in the public or private sectors.
- Graduate school in Science and Technology Studies; Science, Technology, and Environmental Policy; History of Science, or Philosophy of Science; Science and Technology Journalism.

STS Double Major

Students in a technical or scientific major at NYU Tandon or a different unit of NYU may easily obtain a second major in STS. These students can fulfill the Technology/Science Requirement for the STS major with the courses for their other majors. These students can also use their six General Education Humanities and Social Sciences Electives to partially satisfy the STS Restricted Electives Requirement. STS double majors must also satisfy the STS Core Requirement.

Sample Typical Courses of Study

A typical STS semester is split between two tech/science courses and two humanities/social sciences courses. The flexibility of the STS major admits many variations, some with heavier tech/sci concentrations than others. Students work closely with their mentors in constructing an appropriate programs of study. The following sample schedules indicate some of the possible Tech/Sci concentrations. Additional sample schedules are available upon request.

Non-Degree

Science and Technology Studies Minor

The STS minor is open to all NYU majors. It includes 16 credits in STS. One of the core courses in STS must be taken at Tandon.

1. Core Requirement:

Either

- STS-UY 2004 Science, Technology, and Society *4 Credits*
  or

- STS-UY 3004W Seminar in Science and Technology Studies *4 Credits*

2. Elective Requirements:

Remaining credit requirements (12 credits) must be satisfied by courses chosen from the STS Cluster of electives from the Department of Technology, Culture and Society department or by approval by the STS advisor. At least one course must taken at Tandon.

Contact Information:

Departmental Adviser: James Lewis

jpl366@nyu.edu

Bachelor of Science

Science and Technology Studies, B.S.

Bachelor of Science Degree Requirements

STS majors take 120 credits, divided into four parts:

1. General Education Requirement: 40 Credits

(a) Texts, Communication and Social Thought Requirement: 2 courses, 8 Credits

i. EXPOS-UA 1 and EXPOS-UA 2 - Writing the Essay and the Advanced College Essay

(b) Free Electives Requirement: 32 Credits

2. Technology/Science Requirement: 40 Credits

The minimum cumulative GPA for this requirement must be 3.0.

(a) Innovation and Problem Solving Requirement: 5 Credits

- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- MA-UY 1024 Calculus I for Engineers *4 Credits* or equivalent

(b) Technology/Science Electives: 35 Credits

35 Technology/Science credits taken from any of the following general fields, at least 15 credits of which must be from the same field (unless otherwise indicated by minor requirements specific to a given department and/or approved by the adviser).

- Biological Sciences
- Chemistry
- Computer Science
- Engineering
- Mathematics
- Applied Physics

3. STS Requirement: 40 Credits

Each class must be passed with a minimum grade of C.

(a) Core: 16 Credits

- STS-UY 1004W Science, Technology, and Society *4 Credits*
- STS-UY 3004W Seminar in Science and Technology Studies *4 Credits*
- STS-UY 4034 Internship *4 Credits*
- STS-UY 4002 Capstone Project I in Science and Technology Studies *2 Credits*
- STS-UY 4202 Capstone Project II in Science and Technology Studies *2 Credits*

(b) Restricted Electives: 24 Credits

6 courses from the Science, Technology, and Society (STS) cluster of Humanities and Social Sciences courses (excluding those taken to fulfill the Core Requirement 3a). These courses include STS-prefixed courses as well as those listed under the STS Cluster in the Humanities and Social Sciences Electives List.

Typical Course of Study for STS Major, Tech/Sci Concentration Undefined

First Year

Fall Semester: 17 Credits

- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- Tech/Sci Elective 1 *4 Credits*
- Free Elective 1 *4 Credits*
- MA-UY 1024 Calculus I for Engineers *4 Credits*

Spring Semester: 16 Credits

- STS-UY 1004W Science, Technology, and Society *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

- Free Elective 2 *4 Credits*
- Tech/Sci Elective 2 *4 Credits*

Sophomore Year

Fall Semester: 12 Credits

- Tech/Sci Elective 3 *4 Credits*
- Tech/Sci Elective 4 *4 Credits*
- Free Elective 3 *4 Credits*

Spring Semester: 16 Credits

- STS Elective 1 *4 Credits*
- STS Elective 2 *4 Credits*
- Tech/Sci Elective 5 *4 Credits*
- Free Elective 4 *4 Credits*

Junior Year

Fall Semester: 16 Credits

- STS-UY 4034 Internship *4 Credits*
- STS Elective 3 *4 Credits*
- Tech/Sci Elective 6 *4 Credits*
- Free Elective 5 *4 Credits*

Spring Semester: 16 Credits

- STS Elective 4 *4 Credits*
- Free Elective 6 *4 Credits*
- Tech/Sci Elective 7 *4 Credits*
- STS-UY 3004W Seminar in Science and Technology Studies *4 Credits*

Senior Year

Fall Semester: 13 Credits

- STS-UY 4002 Capstone Project I in Science and Technology Studies *2 Credits*
- STS Elective 5 *4 Credits*
- STS Elective 6 *4 Credits*
- Tech/Sci Elective 8 *3 Credits*

Spring Semester: 14 Credits

- STS-UY 4202 Capstone Project II in Science and Technology Studies *2 Credits*
- STS Elective 7 *4 Credits*
- Free Elective 7 *4 Credits*
- Free Elective 8 *4 Credits*

Total credits required for the degree: 120

Sustainable Urban Environments

Program Director: Richard Wener
Program Adviser: James Lewis

General Information

Cities play a critical role in addressing the environmental challenges that face the world today. The major in Sustainable Urban Environments prepares students to make cities more sustainable. Students gain an understanding of the social and technical issues in urban environmental problems, and an appreciation of the policy and planning approaches that are necessary to create more livable, sustainable, and equitable cities. Multidisciplinary courses emphasize project-based learning, using New York City as an urban laboratory, and also examining sustainable cities in a global context. Among the topics addressed in SUE at NYU Tandon are:

- Urban infrastructure: What it is, how it works and history and political systems in development with emphasis on New York City.
- Urban sustainability.
- The design and planning of cities to promote health and well-being.
- The city as a social and technical system, including the psychology of sustainable design.
- Human and natural ecology in the city: How people, animals and plants survive and interact in the urban environment to make the city survivable, healthy and pleasant.

Program Highlights

NYU Tandon offers a unique combination of New York City's resources and the city's preeminent technological institution.

New York City is a cultural, social, technological and financial capital to America and the world. The city has committed itself to becoming "green" at a grand scale and rapid pace. The issues we study in SUE are played out in New York City, as are opportunities to learn, study and work in these processes. The SUE program is a rare combination of liberal arts (such as urban history and environmental psychology) and technology (civil and transportation engineering), combining offerings to produce students who are conversant with both the technical and social aspects of sustainability issues facing our cities.

Project-Oriented Education and Research

A project-oriented semester-studying abroad or engaging in an internship- bridges the gap between academics and the outside world. Capstone Projects provide students with essential experience in solving these complex, real world urban problems.

Careers

Students with the BS Degree in SUE might pursue further study and careers in fields such as:

- Urban planning
- Historical preservation
- Architecture or Landscape architecture
- Urban management
- Law
- Social work
- Education
- Museum curator
- Journalism

Non-Degree

Sustainable Urban Environments Minor

The program in Sustainable Urban Environments (SUE) prepares students to join scholars, policymakers, and other professionals as they work to create sustainable urban areas. The SUE program combines the liberal arts and technology, to ensure that students are conversant with both the contemporary technical and social problems of sustainability that face cities. Students in the minor can take courses in sustainable cities, urban policy, and city design, as well as courses in civil engineering and infrastructure planning. This minor is open to all NYU majors. Students seeking a minor in SUE must complete at least 16 credits of courses in the program, as described below:

SUE Core Courses

At least two courses from the SUE Core:

- URB-UY 2054W Introduction to Urban Policy *4 Credits*
- HI-UY 3034W History of New York's Urban Infrastructure *4 Credits*
- URB-UY 2024W Design of Cities *4 Credits*
- URB-UY 2044 Methods for Studying Urban Environments *4 Credits*

Remaining Credits

The remaining credits can be from other SUE core courses listed above or any other course with a URB-UY designation.

Contact Information:

Departmental Adviser: James Lewis

jpl366@nyu.edu

Bachelor of Science

Sustainable Urban Environments, B.S.

Bachelor of Science Degree Requirements

SUE majors take 120 credits, divided into three parts:

General Education Requirements: 20 Credits

- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*
- General Technical Elective 4 *Credits*
- **(8) Credits of Science:**
  General Science Elective 4 *Credits* **and URB-UY 2334 Introduction to Environmental Sciences**
- **(4) Credits of Statistics- Choose one of the following:**
  MA-UY 2414 Basic Practice of Statistics **or MA-UY 2224 Data Analysis or**
  (CAS) ECON-UA 18, Statistics **or** (CAS) CORE-UA 105, Quantitative Reasoning: Elementary Statistics **or** (CAS) PSYCH-UA 10, Statistics for the Behavioral Sciences **or** (CAS) SOC-UA 302, Statistics for Social Research

Humanities and Social Sciences General Education Requirements: 24 credits

- EXPOS-UA 1 Writing the Essay *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- 4 Humanities and Social Sciences courses, including at least one course of Level 3 and one Writing Intensive course

Sustainable Urban Environments Requirements

A. Core: 33 Credits

- CE-UY 1002 Introduction to Civil Engineering *2 Credits*
- URB-UY 2004 Global Perspectives on Urban Sustainability *4 Credits*
- URB-UY 2024W Design of Cities *4 Credits*
- URB-UY 2044 Methods for Studying Urban Environments *4 Credits*
- URB-UY 2054W Introduction to Urban Policy *4 Credits*
- HI-UY 3034 Introduction to Urban Infrastructure History *4 Credits*
- URB-UY 4012 Capstone Project I *2 Credits*
- URB-UY 4022 Capstone Project II *2 Credits*
- URB-UY 4034 Internship *4 Credits*

And one of the following Civil Engineering courses:

- CE-UY 2323 Traffic Engineering I *3 Credits*
- CE-UY 3313 Introduction to Transportation Systems *3 Credits*
- CE-UY 3363 Transportation Economics *3 Credits*
- CE-UY 4033 Introduction to Urban Infrastructure Systems Management *3 Credits*

- CE-UY 4043 Sustainable Cities *3 Credits*

B. Tracks: 4 Courses, 16 Credits

Students should Select at least 1 course from each group

History Group

- CE-UY 3353 History of the New York City Transit System *3 Credits*
  or
- HI-UY 2514W Introduction to New York City History *4 Credits*
- HI-UY 2724 Urban Environmental History *4 Credits*
- HI-UY 4334W Seminar in Urban Infrastructure History *4 Credits*

Social Sciences Group

- PS-UY 2724 Human Factors in Engineering Design *4 Credits*
- PS-UY 3324 Environmental Psychology *4 Credits*
- PS-UY 3724 Psychology of Sustainability *4 Credits*
- PS-UY 3754 Psychology of Living in Extreme Environments *4 Credits*
- URB-UY 2034 Humans in the Urban Environment *4 Credits*
- URB-UY 2114 Geographic Information Systems *4 Credits*
- URB-UY 3354 Urban Impact Assessment *4 Credits*

Environmental Group

- SEG-UY 2184W Beyond Oil: Fueling Tomorrow's Vehicles *4 Credits*
- SEG-UY 2194W Writing About Nature and the Environment *4 Credits*
- URB-UY 2064 Introduction to Urban Planning *4 Credits*
- URB-UY 2224 Natural Environment of New York City *4 Credits*
- URB-UY 2234 Natural Environmental Catastrophes and Cities *4 Credits*
- URB-UY 3034 Evidence-Based Design *4 Credits*
- URB-UY 3214 Cities in Developing Countries *4 Credits*
- URB-UY 3234 Planning for Healthy Cities *4 Credits*
- URB-UY 3314 History and Design of Urban Parks *4 Credits*

Other

- CE-UY 3373 Transportation Systems Analytics *3 Credits*
- URB-UY 3834 Special Topics in Sustainable Urban Environments *4 Credits*
- URB-UY 401X SUE Global Experience *1-4 Credits*

Electives Requirement

A. Technical Electives: 7 Credits

The technical electives requirement can be fulfilled by any course that advances the student's knowledge of, or skills in applied science, engineering, or computer science. Students may choose 3 or 4 credit courses.

*Technical elective overload may be applied to free credits.

B. Free Electives: 20 Credits

Students may choose 5 courses from any department.

Typical Course of Study for the Bachelor of Science in Sustainable Urban Environments

Note: A typical SUE semester is split between two technology/science courses and two humanities/social sciences courses. The flexibility of a SUE major allows many variations, some with heavier technology/science concentrations than others. Each SUE student customizes his or her curriculum in consultation with the program's academic adviser. What follows is one way to fulfill the degree requirements, and this particular plan concentrates electives in the second semester of the third year so that a student can study abroad in one of New York University's global university campuses.

First Year

Fall Semester: 12 Credits

- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*
- SUE Track Course *4 Credits*

Spring Semester: 14 Credits

- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- CE-UY 1002 Introduction to Civil Engineering *2 Credits*
- URB-UY 2004 Global Perspectives on Urban Sustainability *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Second Year

Fall Semester: 16 Credits

- URB-UY 2024 Design of Cities *4 Credits*
- URB-UY 2334 Introduction to Environmental Sciences *4 Credits*
- SUE Track Course *4 Credits*
- Humanities and Social Science Elective *4 Credits*

Spring Semester: 15 Credits

- CE-UY 3303 Traffic Engineering or CE-UY 3313 Introduction to Transportation Systems or CE-UY 4033 Introduction to Urban Infrastructure Systems Management or CE-UY 3363 Transportation Economics
- URB-UY 2044 Methods for Studying Urban Environments *4 Credits*
- SUE Track Course *4 Credits*
- MA-UY 2414 Basic Practice of Statistics *4 Credits* **or** MA-UY 2224 Data Analysis **or** ECON-UA 18- Statistics or CORE-UA 105- Quantitative Reasoning: Elementary Statistics **or** PSYCH-UA 10- Statistics for the Behavioral Sciences **or** SOC-UA 302- Statistics for Social Research

Third Year

Fall Semester: 16 Credits

- Free Elective *4 Credits*
- Free Elective *4 Credits*
- SUE Track Course *4 Credits*
- URB-UY 4034 Internship *4 Credits*

Spring Semester: 16 Credits

- URB-UY 2054W Introduction to Urban Policy *4 Credits*
- Free Elective *4 Credits*
- General Technical Elective *4 Credits*
- HI-UY 3034W History of New York's Urban Infrastructure *4 Credits*

Fourth Year

Fall Semester: 17 Credits

- SUE Track Course *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*
- General Technical Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits*
- URB-UY 4012 Capstone Project I *2 Credits*

Spring Semester: 14 Credits

- URB-UY 4022 Capstone Project II *2 Credits*
- Free Elective *4 Credits*
- Free Elective *4 Credits*
- General Technical Elective *4 Credits*

Total credits required for the degree: 120

Department of Technology Management and Innovation

Chair: Professor Oded Nov

Mission Statement

The mission of the Department of Technology Management is to act as a major educational gateway and premier learning and research hub devoted explicitly to broadly defined innovation and technology management and entrepreneurship. The scholarly intellectual capital it produces and its tailored programs at the undergraduate, graduate and doctoral levels enable the department to provide unique and valuable opportunities for students, practicing managers and scholars. The department is committed unequivocally to upgrade and revise continually its learning programs and courses to meet fast-changing demands of a dynamic, innovation-driven and competitive environment and to be an academic leader in technology management.

The Department

Effective technology and innovation management and entrepreneurship increasingly determine success in business today. The Department of Technology Management is an acknowledged pioneer and leader in the New York City/tri-state region and beyond in offering courses and programs about these increasingly critical arenas. The department serves a diverse and broad range of professionals, and its faculty and students compose a vital and forward-thinking research and learning community. The department's research and educational offerings focus on a broad range of sectors, including financial and professional services; retailing and logistics; bio-medical, biotechnology and pharmaceuticals; renewable energy and clean technology; media and entertainment; IT, telecom, networks and modern electronic business; and non-for-profits and government-all constituting areas of greatest growth and opportunity in the modern economy, especially in New York City, the nation's foremost global city.

Contact Information

NYU Tandon School of Engineering
Five MetroTech Center
Brooklyn, NY 11201
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Web: http://engineering.nyu.edu/academics/departments/technology

Degrees Offered

Bachelor of Science

- Business and Technology Management, B.S. offered by the Business and Technology Management Program

Master of Science

- Management of Technology, M.S. (MOT) offered by the Management of Technology Program
- Industrial Engineering, M.S. (IE) offered by the Industrial Engineering Program

Doctor of Philosophy

- Technology, Culture and Society Ph.D. offered by the Technology Management Program

Research Profile

The Department of Technology Management consists of an interdisciplinary group of scholars that studies various aspects of technology and innovation - strategic, behavioral, organizational and sociological. Some specific streams of research and sub-topics include:

- Global innovation and R&D strategy - Managing emerging technologies - Technology and development - Service design and innovation -Tech entrepreneurship and commercialization - Sustainable and clean-tech innovation
- Impacts of information technology upon individuals, organizations and society - Citizen science - Social computing - Open source - Business model innovation - Pervasive information services
- Sociological aspects of technology and work - Communicative practices - Distributed collaboration and virtual teams - Knowledge management - Leading Distributed and Virtual Organizations - Project Management

Educational Programs

Undergraduate Program

The Department of Technology Management offers a Bachelor of Science in Business and Technology Management (BTM). This program prepares students to be next generation managers in fields dominated by technological innovation and especially the rapid advancement of information technology and other fields in the applied science and engineering disciplines. Students completing the BTM Program are prepared to succeed in positions such as technology project leaders, technology savvy entrepreneurs, technology and IT analysts, customer-relationship managers and in other cross-functional roles, and developers of business innovations in financial services and other professional services fields.

Minor in Management

Undergraduate students may obtain a Management Minor by completing 14 credits of undergraduate management courses. An overall GPA of at least 2.0 must be maintained. At least 8 of the 14 credits must be taken by students while enrolled at Tandon.

Graduate Programs

The department offers a portfolio of redesigned and modernized educational programs, all dealing with the broad spectrum of innovation, technology management and entrepreneurship in the modern economy, and the department's graduate programs attract a wide range of students and professionals. This is because all managers should understand how technology and innovation management and entrepreneurship are essential for delivering value to organizations and to the market.

The department offers several graduate and professional programs, two of which are earned in executive management format (meeting every other week on Thursday evening and all day Saturday) and four of which are offered on weekday evenings. One program is offered in both formats.

The department's graduate and professional programs include:

Students may pursue the MOT and IE programs either part time or full time with an evening schedule. Each has concentrations that allow students to specialize in selected areas.

We encourage and welcome prospective students to apply to our other thriving and innovative graduate programs: the Management of Technology (MOT) and Industrial Engineering (IE). Further information on these programs can be found on the department's website.

Doctor of Philosophy in Technology Management

Modern technologies increasingly and profoundly affect the management of products, services, processes, organizational forms, business models, the shape of industry structures and modern business environments, the available kinds of technology-enabled innovation and the capability of integrating technology and management-all aimed at creating value for customers and organizations. The ability to conduct research on and to educate about the managerial implications of such topics- all composing technology management-is a highly sought-after and important arena for business scholarship and education. The PhD in Technology Management provides this increasingly significant set of scholarly and educational opportunities.

This degree program is for research-oriented students. Both full-time and part-time students are accepted. Admission criteria include academic record, professional experience, research potential, GMAT or GRE scores, references and a writing sample.

Please visit the program's website for more information.

All management undergraduate and graduate degree programs, as well as certificate programs, are further described in this catalog.

Student Professional Societies, Associations and Organizations

The Management of Technology Alumni Association actively seek to continue and expand shared professional experience gained during and after the programs. Members meet face to face or electronically to share insights obtained in their work experiences and to debate issues broadly relevant to technology management.

The student club associated with the Bachelor of Science in Business and Technology Management degree program is a strong and valued component of the social fabric of undergraduate life at the School of Engineering. This organization works to create professional knowledge and opportunities for members.

Faculty

Professors

Harold G. Kaufman, Professor of Technology Management; Academic Director, Organizational Behavior Program; Academic Director, Department of Management Extension in Israel MIE,
PhD, New York University
BME, Cooper Union for the Advancement of Science and Art
Managing professional and technical workers, career management, obsolescence of knowledge and skills, research methods

Associate Professor

Bharat P. Rao, Associate Professor of Technology Management
PhD, University of Georgia
Managing emerging technologies, broadband, wireless and digital business, global innovation, strategic marketing, IT in the supply chain, alliances, networks and collaborative enterprises

Oded Nov, Assistant Professor of Technology Management
PhD, University of Cambridge, UK,
MSC, London School of Economics, UK
Technology management, behavioral aspects of information systems, knowledge management, motivations of open source and user-generated content contributors

Anne-Laure Fayard, Assistant Professor of Technology Management
PhD, Ecole Des Hautes Etudes en Sciences Sociales (France)
Discourse analysis, communication, online communities, social-material practices, space and culture

Industry Faculty

Pavlos Mourdoukoutas, Academic Director and Industry Professor
PhD, University of Connecticut
MS, Stony Brook University

Professional Staff

Bohdan Hoshovsky, MSM and BS-BTM Academic and Administrative Program Director
PhD, Pacifica Graduate Institute

Aric C. Meyer, Academic Advisor - M.S. Management of Technology & M.S. Industrial Engineering
MED, Northeastern University

Elizabeth Spock, Academic Advisor
MA, New York Univeristy

Khidene David, Program Coordinator

Adjunct Faculty

Frank Apicella
MBA, New York University
Finance

John Artise
MA, New York University
Global human resource management

Tushar Bhattacharjee
PhD, Post-Doctoral Research, MIT and Osaka University
Data communications, electrical engineering

Andrew Biga
PhD, University of South Florida
Talent management, human capital analytics

Robert Biolsi
PhD, Graduate Center, College University of New York
Finance, inflation, equity prices and commodity diversification, electricity deregulation

Jabril Bensedrine
PhD, ESSEC Graduate School of Business (France)
Entrepreneurship, corporate entrepreneurship, technology strategy

Ravi Bhatia
MS, Polytechnic Institute of New York
Project management

Denise Bracamonte
BA, St. John University; PMP and PMI
Certified Project management
Project management

Aurora Brito
MBA, Suffolk University
Coaching in organizations, organizational behavior

Vaughan Coleman
MSOB, Polytechnic University
MA, New York University
Eed, Columbia University
Knowledge Management in HR

Vincent Conte
PhD, Hofstra University
Globalization and technology in HR, Business processing re-engineering, Human capital engineering, Organization development

Alejandro Crawford
MBA, Tuck School, Dartmouth
Entrepreneurial marketing and sales, managing growing enterprises, marketing

Anthony Deak
MS, Polytechnic Institute of New York
Foundations of management, global perspectives in management

Matthew J. DeLuca
MPA, University of Pittsburgh
Conflict management, labor relations, performance management, reward systems, organizational consulting, outsourcing

Michael D'Emic
PhD, National University of Ireland, Cork
MBA, Trinity College (Dublin)
Accounting, finance

Philip Dorin
PhD, University of Connecticut
Training and development

Michael Driscoll
MBA, Polytechnic Institute of New York University
Global innovation, managing cloud computing

Roger D. Eisenhardt
MA, Puclic Administration, CW Post College
MS, Organizational Behavior, Polytechnic Institute of NYU
Human resource management, organizational behavior

James Fazio
MA and MBA, St. John's University
Operations management

Philip Ferrara
Adjunct Associate Professor of Management
PhD, Hofstra University
Organizational staffing, job design, employee engagement, job and workplace design

William Feuss
PhD, Stevens Institute of Technology
Marketing

Sara Grant
PhD, New York University
Organizational theory and design, research methods

Edward Greenbaum
MS, Cornell University
Industrial and labor relations

Bohdan Hoshovsky
PhD, Pacifica Graduate Institute
Organizational behavior, project management, general management, transhumanism

Jonatan Jelen
MBA, Ecole Superieure de Commerce de Paris
PhD candidate, Baruch
Economics, supply chain management

David Kalow
JD, University of Chicago
Intellectual property

Zuño Kristal
EdD, Columbia University
Leadership, organizational learning, executive coaching

Howard Kupferman,
MS, Polytechnic Institute of New York
MBA, Finance, Fordham University
Organizational behavior, business ethics, human resource management, marketing

Rob Marano
MS, University of Pennsylvania
Entrepreneurship, engineering

Thomas Mazzone
MBA, Theseus Institute (France)
Operations management, supply chain management, project management

Marc S. Miller
MBA, Iona College
Human resource management, managing HR technology

Mark Mishken
PhD, University of Tennessee
Organizational staffing, organizational behavior

Pavlos Mourdoukoutas
PhD, University of Connecticut
Economics

Carl Nelson
MIE, New York University
Operations management

Bruce Niswander
JD, MBA, Ohio State University
Entrepreneurship, entrepreneurial finance, managing intellectual property and intellectual capital

James Paguagua
MBA, Pace University
New product development, marketing

John Reilly
MA, Columbia University
Human resource information systems, web-based human resource management, managing new technology in HR

Ron Spinelli
MS, Brooklyn Polytechnic University
Supply chain management, strategic business

Carla Visser, Adjunct Associate Professor of Management
M.Ed, Rutgers University
Coaching in organizations

Jack Yurkiewicz
PhD, Yale University
Management science

Anthony Zinsser
PhD, Stevens Institute of Technology
Organizational behavior, organization development, talent management, leadership and team development

Yael Zofi
MA, Columbia University
Coaching in organizations, leadership and team development

Advisory Boards

Corporate and Academic

The Department of Technology Management maintains deep ties with a wide range of firms in a host of knowledge- and innovation-intensive sectors. The department is honored to have a distinguished and active Corporate Advisory Board. The department also works closely with high-quality academic institutions and colleagues worldwide and is honored to have an active and highly respected Academic Advisory Board. Both boards meet regularly to review the department's programs, research and plans. In this manner, the department stays informed, meets the pragmatic and scholarly needs and critical challenges confronting technology and innovation executives and entrepreneurs, and assures that its courses and programs are state of the art and relevant.

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Non-Degree

Technology, Management and Design Minor

As Design Thinking is ubiquitous throughout the technology landscape regardless of industry, company structure, location and size, the TMD minor's course offerings provide a contemporary, useful and applicable set of technology management tools and inculcates a design-thinking mindset. The TMD minor provides a multi-disciplinary complement, not only for STEM, but for many other disciplines taught at NYU.

TMD prepares students for the professional dual ladder model of "engineering and management" - ascending career positions through the dual rungs of technological prowess+skills, and managerial expertise. As such, TMD "graduates" will be prepared to climb the career ladders facing them and be poised for successes in diverse professional environments. With companies' increasing demand for creative, innovative and collaborative employees, students taking the TMD minor will have the opportunity to develop key skills for their future career: collaboration skills, project experience and a portfolio of innovative techniques. Career prospects range across industries such as technology, finance, healthcare, public service and others.

The TMD Minor is open to all NYU students including students in the Tandon SOE BTM* major.

Structure of the Technology, Management and Design (TMD) Minor:

TMD Required Core Course (4 credits):

- MG-UY 2704 Design Thinking for Creative Problem Solving *4 Credits*

TMD Elective Courses: Choose any 3 from the 4 credit courses below (12 credits total):

- MG-UY 3714 Design Strategies *4 Credits*
- MG-UY 3724 Human-centered Product Design *4 Credits*
- MG-UY 3734 Service Design Innovation *4 Credits*
- MG-UY 4404 Entrepreneurship *4 Credits* **
- MG-UY 4114 Special Topics in Management (4 Cr) *4 Credits* (with a topic specifically announced and designated under the TMD minor, with a pre-req of MG-UY 2704)
- More TMD related MG-UY courses are planned.

TMD Restrictions:

Students may not double count courses between the Tandon SOE Cross School Management Minor*** and this Tandon SOE Minor in Technology, Management and Design and required courses in the Tandon SOE BTM* major.

Notes:

* BTM refers to the Tandon SOE TMI Department's BSc in Business and Technology Management major.

** MG-UY 4404 Entrepreneurship is a degree requirement for BTM* students and therefore is an anti-requisite and cannot be applied towards the TMD Minor. MG-UY 4404 is open to all declared TMD minor students.

*** BTM* students are not eligible to participate in the Tandon SOE Management Minor.

**** BTM majors may only count TMD courses towards BTM Free Electives or in addition to BTM Degree requirements.

Contact Information:

Departmental Adviser: Bohdan Hoshovsky

bh863@nyu.edu

Business and Technology Management

Academic and Administrative Program Director: Bohdan Hoshovsky

Goals and Objectives

The Bachelor of Science in Business and Technology Management (BTM) Program is a STEM program. It is anchored on certain overarching themes, including:

- Achieving prowess through innovation, technology management and entrepreneurship.
- Leading based on a broad understanding of technology's role in the modern enterprise.
- Developing a global perspective of modern value creation.
- Committing oneself to service to the community.
- Adhering to the highest ethical standards.
- Obtaining practical exposure-through internships, speakers, on-site visits in New York City, etc.-to the latest best practices in management, especially as related to technology and innovation management and entrepreneurship.

BTM is oriented toward current and future arenas where high growth occurs. The program assumes that modern business leaders must be deeply familiar with technology and innovation. Those who have such knowledge are likely to have a distinct advantage and prosperous and satisfying careers. When appropriate, these leaders also can leverage entrepreneurship in diverse venues. The BTM Program prepares students to become such leaders.

BTM also provides students with relevant professional management education and effective approaches related to technology, innovation and information management and entrepreneurship. In other words, BTM creatively fuses modern business administration with state-of-the-art technology management.

The BTM Program is STEM based which offers rigorous training in the qualitative, quantitative and innovative aspects of technology and innovation management. All courses nurture a broad managerial background along with specific application of ideas and practices relevant to the world of technologically innovative goods and services.

The art and science of management also demand that practitioners communicate ideas effectively. Therefore, as central components of the BTM learning experience the program emphasizes spoken and written presentations in individual, team, classroom and field internship settings.

Students completing BTM are prepared to succeed in a variety of positions-such as technology project leaders, technology entrepreneurs, venture capitalists, technology and IT analysts for various organizations, consultants in professional-services firms, marketing and business-unit managers for new products and services, and a variety of other exciting roles. BTM graduates work in large and small companies and they excel at jobs that require a cross-functional understanding of both technology and the motivational, financial, innovative and international challenges that need to be met for innovation to succeed. BTM students are also well prepared for advanced professional studies in management, such as in a MS in Management of Technology (MOT), or an MBA program, as well as more scholarly and research oriented programs, such as PhD studies.

Pedagogy

Management courses are taught using a variety of pedagogical methods.
These include:

- Theory-led teaching
- Case-method education
- Project-based and team-based teaching
- Action learning in the field

Experiential-Based Learning

Teaching based on exposition of theory is often relevant to technology management classes. Case-method teaching emphasizes real-world business experiences and challenges students to draw general principles from many examples. Project-based and team based education is experiential; students learn by doing, much as they would in a natural sciences laboratory class. Learning by doing in the field is also encouraged. It is very common in management courses for all pedagogical approaches to be employed.

Course Distribution

The STEM based BTM Program requires 127 or 128 credits for graduation. Key characteristics* of this curriculum include:

- 56 credits in management
- 32 credits in courses in humanities and social sciences
- 12 credits in courses in mathematics
- 8 credits in "restricted" electives chosen from math, science, social sciences and humanities
- 7 credits in science
- 4 credits in computer science
- 4 credits in a "technical" elective
- 1 credit in the Engineering and Technology Forum
- 3 or 4 credits in Free Electives

*Please see the Business and Technology Management, B.S. for the Typical Course of Study.

Currently, most management courses for the BS in BTM are each 4 credits except for two courses at 2 credits. This current curriculum accommodates 4-credit courses in humanities and social sciences, as well as 3-credit courses in the sciences.

Course Numbering

BTM courses are numbered with the following schema:

- The first digit of a course number corresponds to the year in which a BTM student would take the course (1 = first year, etc.)
- The second digit reflects the primary nature of the course material. Courses numbered with a second digit of
  "0" are focused primarily on processes in management
  "1" are oriented toward organizational behavior
  "2" are quantitative in nature
  "3" describe a firm's relationships with external forces
  "4" study innovation
  "5" are capstone courses
  "6" are Internship and Service courses
  "9" thesis

Thus, MG-UY 3304 Introduction to Supply Chain Management is a 4-credit junior-year course focusing on external relationships.

Concentrations

Students in this degree program may focus their study in one of two areas of concentration, which focus on particular issues and strategies that apply to business and technology management:

1. **Technology Innovation Strategy** enables students to develop effective skills for conducting strategic analysis addressing marketing, logistics, channel and operations managements issues, as well as relevant best business practices in the technological arena.
2. **Technology and Innovation in Finance** prepares students to understand financial theory and how firms use modern finance for strategic and tactical decision-making.

Candidates who choose the first concentration complete MG-UY 3304 (Introduction to Supply Chain Management) in their 6th semester and MG-UY 4004 (Management Strategy in Technology Sectors) in their 7th semester. Students electing the Technology and Innovation in Finance concentration of study must complete both MG-UY 3214 (Advanced Corporate Finance) in their 6th semester and MG-UY 4214 (Financial Strategy) in their 7th semester.

Degree Requirements
To remain in good standing, candidates for the degree BS-BTM must satisfy the following requirements, in addition to NYU Tandon requirements for a minimum term and cumulative 2.0 GPA in all courses:

- An average of C (2.0) or better in all MG courses must be maintained.
- A course in which the grade of I is received may not be used to satisfy any prerequisites until the incomplete is resolved.

Honors Capstone
(Including Thesis and Honor's Thesis)
Students who earn a 3.6 GPA or better in MG-UY courses through their junior year of study qualify for honors senior project capstone courses when available. These students are also free to not elect this project sequence.

As part of the Honor's Capstone course, students who earn a 3.6 GPA or better in MG courses through their junior year qualify for an optional MG-UY 4904 BS Thesis in Business and Technology Management and follow the guidelines as outlined in the Academic Policies and Degree Requirements section of this catalog. They are advised to meet with the BTM Program Director before completing their junior year.

Transfer Students

Courses at other schools may or may not be granted transfer credit and require an evaluation of the content and level of material covered. Periodic reevaluation of courses at other institutions may lead to a variation in the number of credits granted from year-to-year. Thus, students completing the same program, but in different years, may receive different amounts of transfer credit.

Transfer students must present their records for evaluation at least two weeks before the regular registration period for their first semester.

Information

Curricula and prerequisite changes, new courses, special sections and other special announcements are posted in the Department of Technology, Management and Innovation office suite and on the program's website at http://engineering.nyu.edu. Students are responsible for keeping informed, tracking their progress and are encouraged to visit the BTM Program Director regularly.

Non-Degree

Management Minor

Students may obtain an undergraduate minor in management by completing 14 credits of undergraduate (MG) management courses, which must include MG-UY 1002 Foundations of Management. An overall GPA of at least 2.0 must be maintained in these classes. At least 8 of the 14 credits must be taken by students while enrolled at the School of Engineering.

For more information, please reference the BSBTM Program.

Contact Information:

Departmental Adviser: Bohdan Hoshovsky

bh863@nyu.edu

Bachelor of Science

Business and Technology Management, B.S.

Academic and Administrative Program Director: Bohdan Hoshovsky

Goals and Objectives

The Bachelor of Science in Business and Technology Management (BTM) Program is a STEM program. It is anchored on certain overarching themes, including:

- Achieving prowess through innovation, technology management and entrepreneurship.
- Leading based on a broad understanding of technology's role in the modern enterprise.
- Developing a global perspective of modern value creation.
- Committing oneself to service to the community.
- Adhering to the highest ethical standards.
- Obtaining practical exposure-through internships, speakers, on-site visits in New York City, etc.-to the latest best practices in management, especially as related to technology and innovation management and entrepreneurship.

BTM is oriented toward current and future arenas where high growth occurs. The program assumes that modern business leaders must be deeply familiar with technology and innovation. Those who have such knowledge are likely to have a distinct advantage and prosperous and satisfying careers. When appropriate, these leaders also can leverage entrepreneurship in diverse venues. The BTM Program prepares students to become such leaders.

BTM also provides students with relevant professional management education and effective approaches related to technology, innovation and information management and entrepreneurship. In other words, BTM creatively fuses modern business administration with state-of-the-art technology management.

The BTM Program is STEM based which offers rigorous training in the qualitative, quantitative and innovative aspects of technology and innovation management. All courses nurture a broad managerial background along with specific application of ideas and practices relevant to the world of technologically innovative goods and services.

The art and science of management also demand that practitioners communicate ideas effectively. Therefore, as central components of the BTM learning experience the program emphasizes spoken and written presentations in individual, team, classroom and field internship settings.

Students completing BTM are prepared to succeed in a variety of positions-such as technology project leaders, technology entrepreneurs, venture capitalists, technology and IT analysts for various organizations, consultants in professional-services firms, marketing and business-unit managers for new products and services, and a variety of other exciting roles. BTM graduates work in large and small companies and they excel at jobs that require a cross-functional understanding of both technology and the motivational, financial, innovative and international challenges that need to be met for innovation to succeed. BTM students are also well prepared for advanced professional studies in management, such as in a MS in Management of Technology (MOT), or an MBA program, as well as more scholarly and research oriented programs, such as PhD studies.

Pedagogy

Management courses are taught using a variety of pedagogical methods.
These include:

- Theory-led teaching
- Case-method education
- Project-based and team-based teaching
- Action learning in the field

Experiential-Based Learning

Teaching based on exposition of theory is often relevant to technology management classes. Case-method teaching emphasizes real-world business experiences and challenges students to draw general principles from many examples. Project-based and team based education is experiential; students learn by doing, much as they would in a natural sciences laboratory class. Learning by doing in the field is also encouraged. It is very common in management courses for all pedagogical approaches to be employed.

Course Distribution

The BTM Program requires 127 or 128 credits for graduation. Key characteristics* of this curriculum include:

- 56 credits in management
- 28 credits in courses in humanities and social sciences
- 12 credits in courses in mathematics
- 8 credits in "restricted" electives chosen from math, science, social sciences and humanities
- 7 credits in science
- 4 credits in computer science
- 1 credit in the Engineering and Technology Forum
- 11-12 credits in Free Electives

*Please see the Typical Course of Study for the BS in BTM Program at the end of this section.

This current curriculum accommodates 4-credit courses in humanities and social sciences, as well as a 3-credit course in the sciences and a 3 credit Free Elective.

Course Numbering

BTM courses are numbered with the following schema:

- The first digit of a course number corresponds to the year in which a BTM student would take the course (1 = first year, etc.)
- The second digit reflects the primary nature of the course material. Courses numbered with a second digit of
  "0" are focused primarily on processes in management
  "1" are oriented toward organizational behavior
  "2" are quantitative in nature
  "3" describe a firm's relationships with external forces
  "4" study innovation
  "5" are capstone courses
  "6" are Internship and Service courses
  "9" thesis

Thus, MG-UY 3304 Introduction to Supply Chain Management is a 4-credit junior-year course focusing on external relationships.

Concentrations

Students in this degree program may direct their study in one of two areas of concentration, which focus on particular issues and strategies that apply to business and technology management:

1. **Technology Innovation and Strategy** enables students to develop effective skills for conducting strategic analysis addressing marketing, logistics, channel and operations managements issues, as well as relevant best business practices in the technological arena.

2. **Technology and Innovation in Finance** prepares students to understand financial theory and how firms use modern finance for strategic and tactical decision-making.

Candidates who choose the Technology Innovation and Strategy concentration must complete both MG-UY 3304 (Introduction to Supply Chain Management) in their 6th semester and MG-UY 4004 (Management Strategy in Technology Sectors) in their 7th semester. Students electing the Technology and Innovation in Finance concentration of study must complete both MG-UY 3214 (Advanced Corporate Finance) in their 6th semester and MG-UY 4214 (Financial Strategy) in their 7th semester.

Degree Requirements

To remain in good standing, candidates for the degree BS-BTM must satisfy the following requirements, in addition to NYU Tandon requirements for a minimum term and cumulative 2.0 GPA in all courses:

- An average of C (2.0) or better in all MG courses must be maintained.
- A course in which the grade of I is received may not be used to satisfy any prerequisites until the incomplete is resolved.

Honors Capstone
(Including Thesis and Honor's Thesis)

Students who earn a 3.6 cumulative GPA or better in MG-UY courses through their junior year of study qualify for honors senior project capstone courses when available. These students are also free to not elect this project sequence.

As part of the Honor's Capstone course, students who earn a 3.6 cumulative GPA or better in MG-UY courses through their junior year qualify for an optional MG-UY 4904 BS Thesis in Business and Technology Management and follow the guidelines as outlined in the Academic Policies and Degree Requirements section of this catalog. They are advised to meet with the BTM Program Director before completing their junior year.

Information

Curricula and prerequisite changes, new courses, special sections and other special announcements are posted in the Department of Technology, Management and Innovation office suite and on the program's website at http://engineering.nyu.edu. Students are responsible for keeping informed, tracking their progress and are encouraged to visit the BTM Program Director regularly.

Typical Course of Study for the Bachelor of Science in Business and Technology Management

See Footnotes [14] and [15]

Freshman Year

Fall Semester: 16 Credits

- MA-UY 1324 Integrated Calculus I for Engineers *4 Credits*
  or MA-UY 1024 Calculus I for Engineers *4 credits* [1a]
- EXPOS-UA 1 Writing the Essay *4 Credits* (Humanities and Social Sciences 1) [2]
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- Science Elective (1) *4 Credits* [3]

Spring Semester: 14 Credits

- MA-UY 1424 Integrated Calculus II for Engineers *4 Credits*
  or MA-UY 1124 Calculus II for Engineers *4 Credits*[1b]
- MG-UY 1002 Foundations of Management *2 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits* (Humanities and Social Sciences 2) [2]
- Science Elective (2) *3 Credits* [3]

Sophomore Year

See Footnotes [11]

Fall Semester: 16 Credits

- MG-UY 2204 Financial Accounting *4 Credits*
- MG-UY 2004 Management of Information Technology and Systems *4 Credits*
- MG-UY 2104 Organizational Behavior *4 Credits*
- TCS CAM/STS/SEG Cluster Elective *4 Credits* (Humanities and Social Sciences 3) [8]

Spring Semester: 16 Credits

- MG-UY 2524 Microeconomics *4 Credits* [12]
- MG-UY 2304 Marketing *4 Credits*
- MG-UY 2014 Operations Management *4 Credits*
- MA-UY 2054 Applied Business Data Analysis I *4 Credits* [13]

Junior Year

See Footnotes [11]

Fall Semester: 18 Credits

- MG-UY 3204 Introduction to Finance *4 Credits*
- MG-UY 3024 Management of Data Communications and Networking *4 Credits*
- MG-UY 3002 Project Management *2 Credits*
- STS-UY 2144 Ethics and Technology *4 Credits* (Humanities and Social Sciences 5) [4]
- Free Elective *4 Credits* [7, 9]

Spring Semester: 16 Credits

- MG-UY 3404 Innovation Management *4 Credits*
- MG-UY 3304 Introduction to Supply Chain Management *4 Credits* (Strat. Con.) [10]
  or
- MG-UY 3214 Advanced Corporate Finance *4 Credits* (Fin. Con.) [10]
- Restricted Elective (1) *4 Credits* [5]
- TCS CAM/STS/SEG Cluster Elective *4 Credits* (Humanities and Social Sciences 6) [2]

Senior Year

See Footnotes [11]

Fall Semester: 16 Credits

- MG-UY 4004 Management Strategy in Technology Sectors *4 Credits* (Strat.Con.) [10]
  or
- MG-UY 4214 Financial Strategy *4 Credits* (Fin. Con.) [10]
- MG-UY 4404 Entrepreneurship *4 Credits* [6]
- Restricted Elective (2) *4 Credits* [5]
- BTM Mandatory TCS STS Cluster Elective *4 Credits* [8] (Humanities and Social Sciences 7) [2]

Spring Semester: 15 or 16 Credits

- MG-UY 4504 Global Perspectives on Technology Management: A Capstone Project Course *4 Credits*
- MG-UY 4204 Management Science *4 Credits* [6]
- Free Elective *3 or 4 Credits* [9]
- Free Elective *4 Credits* [9]

Total credits required for graduation: 127 or 128

Footnotes

[1a] Students who are placed through the Tandon Mathematics Placement Exam or by a Tandon-Courant Mathematics Advisor, into MA-UY 914 Pre-Calculus must successfully complete the course before progressing to MA-UY 1324 Integrated Calculus I for Engineers. MA-UY 1054 Calculus I with Pre-Calculus is no longer offered. A more advanced Calculus I Course than indicated by Tandon-Courant placement exam (MA-UY 1024 Calc 1 for Engineers) may be substituted only with written permission by a Tandon-Courant Mathematics Advisor.

[1b] MA-UY 1052 Calculus II with Pre-Calculus and MA-UY 1154 Calculus II with Pre-Calculus are no longer offered and are replaced by a more advanced Calculus II MA-UY 1424 Integrated Calculus II for Engineers course which follows MA-UY 1324 and may be substituted with MA-UY 1124 Calculus II for Engineers only with written permission by a Tandon-Courant Mathematics Advisor.

[2] Follow latest NYU Tandon School of Engineering & Expository Writing and TCS (HuSS - Humanites & Social Sciences) requirements as stated per the NYU Tandon School of Engineering Bulletin. Note CAM/STS/SEG designate clusters of TCS courses, refer to TCS General Education Requirements for all TCS HuSS courses & prefixes. HUSS8 has been converted into a Free Elective.

[3] BTM students are required to complete a minimum of a total of 7 credits of science electives by choosing 2 approved science elective courses from 2 different course areas as follows: course area 1: (CM-UY 1004 or CM-UY 1014), course area 2: (BMS-UY 1003 with or without BMS-UY 1004 (as BMS-UY 1004 is discontinued)) and course area 3: (PH-UY 1013 or PH-UY 1213). Any science course replacement requires approval by the BSBTM Program Director.

[4] (The prior old PL-UY 2144) STS-UY 2144 Ethics and Technology is mandatory for all BTM majors and counts towards HUSS Credits.

[5] Restricted Electives are Tandon pre-approved courses in math, science, Humanities and Social Sciences (HuSS) ONLY. Computer Science courses may not be counted as Restricted Electives.

[6] Students with a 3.6 GPA or better in major at the end of junior year may substitute, when available, MG-UY 4514 Honors Capstone Project in Technology, Innovation and/or Information Management and Entrepreneurship I (4 credits) or the Bachelor's Thesis in Management (4 credits and with permission by the Dept. Chair) for MG-UY 4404 Entrepreneurship. They may also substitute MG-UY 4524 Honors Capstone Project in Technology, Innovation and/or Information Management Or Entrepreneurship II (4 credits) or MG-UY 4904 BS Thesis in Business and Technology Management (4 credits and with permission by the Dept. Chair) in Management for MG-UY 4204 Management Science . The Bachelor's Thesis in Management may take longer than 1 semester to complete and students must follow all thesis guidelines.

[7] The prior 4cr BTM Technical Elective has been converted into a 4cr Free Elective.

[8] The TCS STS Cluster BTM Mandatory Technology Subset can ONLY be fulfilled by any ONE of the following 4cr TCS Cluster 2: Science, Technology and Society (STS) courses listed below (as writing (W) or non writing courses):

- HI-UY 3304 Science and Technology as a Strategic Resource in World War II
- PL-UY 2004 Symbolic Logic
- PL-UY 2134 Philosophy of Science, Technology and Society in China and India
- PL-UY 2204 Philosophy of Technology
- PL-UY 3004 Metalogic
- PL-UY 3204 Philosophy of Technology: The Critique of Heidegger
- PS-UY 2724 Human Factors in Engineering Design (TCS SEG Cluster 3 course)
- PS-UY 3164 Health Psychology
- PS-UY 3724 Psychology of Sustainability
- PS-UY 3754 Psychology of Living in Extreme Environments
- SEG-UY 2124 Public Policy Issues and the Internet: A Global Perspective
- SEG-UY 2184/W Beyond Oil: Fueling Tomorrow's Vehicles
- STS-UY 1004 Science, Technology, and Society
- STS-UY 2004 Science, Technology, and Society
- STS-UY 2224/W Science and Sexuality
- STS-UY 2234 Introduction to the History of Technology
- STS-UY 2244/W Magic, Medicine, and Science
- STS-UY 2264W Addressing Public Policy Issues in the Sciences, Engineering and Medicine
- STS-UY 2294 Quantum Mechanics and Information
- STS-UY 2324 From Heat Engines to Black Holes
- STS-UY 2364 History of Aviation and Aviation Technology
- STS-UY 2374 The Ship
- STS-UY 2444 History and Philosophy of Internet Technology
- STS-UY 2454W Digital Humanities
- STS-UY 2554 Science and Pseudoscience
- STS-UY 2614W Science Fiction for Innovation
- STS-UY 2624/W The Rhetoric of Science
- STS-UY 2634 Psychology of the Internet
- STS-UY 2644 Creativity and Innovation
- STS-UY 2664 Intelligence: Real and Artificial
- STS-UY 3004W Seminar in Science and Technology Studies
- STS-UY 3204/W Science and Difference
- STS-UY 3214 Science & Feminism

- STS-UY 3234 The Phenomenon Of Life
- STS-UY 3244 The History of Light
- STS-UY 3254/W Philosophy of Science
- STS-UY 3264 Physics, Information and Computation
- STS-UY 3284/W Relativity and Spacetime
- STS-UY 3604 Psychology of Internet Security
- STS-UY 3814 Social Psychology of Virtual Worlds
- STS-UY 3904 Special Topic in STS
- URB-UY 2034 Humans in the Urban Environment
- URB-UY 2044 Methods for Studying Urban Environments
- URB-UY 2064 Introduction to Urban Planning
- URB-UY 2234 Natural Environmental Catastrophes and Cities
- URB-UY 3034 Evidence-Based Design
- URB-UY 3214 Cities in Developing Countries
- URB-UY 3234 Planning for Healthy Cities
- URB-UY 3354 Urban Impact Assessment
- URB-UY 3834 Special Topics in Sustainable Urban Environments

Please note that the above TCS electives may also be used as normal (BTM) HuSS electives.

[9] Free Electives must must follow NYU Tandon guidelines.

[10] Students must select, remain in and complete a BTM Concentration. Current BS BTM Concentrations are Technology Innovation and Strategy Concentration (Strat Concen) & Technology and Innovation in Finance Concentration (Fin Concen). Candidates who choose the Technology Innovation and Strategy concentration must complete both MG-UY 3304 (Introduction to Supply Chain Management) and MG-UY 4004 (Management Strategy in Technology Sectors). Students electing the Technology and Innovation in Finance concentration of study must complete both MG-UY 3214 (Advanced Corporate Finance) taken first, and then MG-UY 4214 (Financial Strategy).

[11] Students may participate in an internship experience through CP-UY 2011 and/or CP-UY 2021 or MG-UY 4603, for a maximum of 3 total internship related credits which will only count as a Free Elective.

[12] ECON-UA 2 Economic Principles II (Microeconomics) was replaced by MG-UY 2524 Microeconomics.

[13] With written permission from the NYU Tandon/Courant Dept. of Mathematics, MA-UY 2054 Applied Data Analysis may be substituted with MA-UY 2224 Data Analysis.

[14] Grandfathering rules may apply.

[15] This chart is for all BSBTM students Fall 2019 onward.

Note: THIS CHART IS ALSO USED FOR ADVISEMENT AND BS BTM DEGREE REQUIREMENT AUDIT CHECKLIST. ALL INFORMATION IS SUBJECT TO REVISION.

Industrial Engineering

Program Director: Tom Mazzone

The Department of Technology Management and Innovation offers a program in industrial engineering at the master's level.

Industrial engineering addresses how systems operate and is concerned with the effective and efficient delivery of quality products and services. The tools applied include analytic modeling, system simulation, queuing systems, work design, project planning, facilities design and quality management and control. Courses are available in each of these topics, many with course projects suited to the practice-oriented degree offered at NYU Tandon.

Many students seek a graduate degree in industrial engineering after completing an undergraduate degree in another engineering discipline. Because industrial engineers often work on multidiscipline teams, students are encouraged to use their electives to add strength in some area related to their career interests, such as the following:

- Mechanical engineering
- Manufacturing
- Operations management
- Construction management
- Management of technology
- Electrical engineering

Graduate advisers work with students to develop a suitable program for either full-time or part-time study, with a product or service orientation.

Opportunities exist in many diverse areas. For example, industrial engineers are called upon to:

- design quality into products and processes;
- apply the principles of total quality management (TQM);
- develop efficient work methods;
- locate facilities and design plant layouts;
- improve productivity and competitiveness;
- schedule and manage projects;
- use computers to simulate physical systems and processes; and
- apply their knowledge in manufacturing and service industries, including finance, health care, logistics and construction. Industrial engineers seek to allocate limited resources effectively. A unifying theme focusing this body of knowledge and methods into a coherent entity is the systems point of view.

Industrial engineering encompasses the search for similarity among concepts, laws and models of different disciplines; the emphasis on the adaptation, integration and exploitation of existing techniques in areas other than their fields of origin; and, above all, a unique point of view dealing with relationships rather than with components. Industrial engineers are thus in a strategic position to bring about the best integration of people, materials, machines, time and money in any endeavor.

These techniques are applied in a wide range of organizations. Industrial engineers work in banks, hospitals, government, transportation and communications, construction, social service, facilities design, manufacturing, warehousing and information processing.

Many industrial engineers move from analyzing and designing productive systems to managing those systems. While engineering and management are different fields, both require the ability to make decisions based on valid information. Industrial engineers are especially trained to obtain and evaluate such information.

Goals and Objectives

The objectives of the Master of Science in Industrial Engineering are for students to:

- develop and apply a systems point of view to the effective supply of quality products and services;
- understand how to adapt, integrate and exploit existing technologies in manufacturing and services, including the application of analytic modeling, system simulation, queuing systems, work design, facilities design and quality management and control;
- learn to measure and allocate the resources of an enterprise optimally;

- become aware of today's industrial drivers and learn tools and techniques to analyze problems and improve performance; and
- acquire a broad knowledge base through the choice of a concentration of courses in industrial engineering and related fields to suit their career needs.

Master of Science

Industrial Engineering, M.S.

Requirements for the Master of Science

The general requirements for the degree Master of Science are stated in this catalog under "Graduate Degrees". Detailed requirements for this degree are shown below.

Admission to the Master of Science program requires a bachelor's degree in a related discipline from an accredited institution. Applicants should have a superior undergraduate academic record. Students who do not meet these requirements are considered individually for admission and may be admitted subject to their completion of courses to remove deficiencies. Students are encouraged to seek waivers (and have approved substitutes designated) for all required courses in which they can demonstrate competence, thereby using their time effectively.

Prerequisite Courses (or equivalent knowledge)

Students must have knowledge of engineering economics and probability and statistics. Prospective students lacking the relevant knowledge may satisfy the requirement by taking probability and statistics (MA-GY 6513 or equivalent).

Up to 3 credits of graduate courses in this category of prerequisite knowledge can be counted toward the degree as electives, although the electives needed for the student's concentration also must be satisfied.

Required Core Courses: 12 Credits

- IE-GY 6113 Quality Control and Improvement *3 Credits*
- IE-GY 6213 Facility Planning and Design *3 Credits*
- IE-GY 6823 Factory Simulation *3 Credits*
- MN-GY 7893 Production Science *3 Credits*

Other Courses: 18 Credits

Students must take three electives from manufacturing or industrial engineering for a total of 9 credits.

The following courses can be used to fulfill the elective requirements for the Masters in Industrial (IE) engineering. Students can also elect to take an additional three courses/nine credits outside of the MN/IE curriculum with approval from their academic advisor.

- MG-GY 6103 Management Science *3 Credits*
- MG-GY 6303 Operations Management *3 Credits*
- MG-GY 8203 Project Management *3 Credits*

- MG-GY 6343 Human Capital Engineering & Analytics *3 Credits*
- MG-GY 6361 Managing Business Process Reengineering *1.5 Credits*
- MG-GY 8643 New Product Development *3 Credits*
- MG-GY 8653 Managing Technological Change and Innovation *3 Credits*
- MG-GY 9753 Business Analytics *3 Credits*
- MG-GY 9753 Quality Management/Six Sigma *3 Credits*

Total: 30 Credits

Note:

Students should elect other courses in consultation with their adviser. Concentrations in areas suited to students' career interest are encouraged (e.g., manufacturing, mechanical engineering, operations management, construction management and management of technology). Courses from computer science or management may supplement such a concentration.

Management of Technology

(Formerly - Accelerated Management of Technology Program)

Academic Director: Ari Ginsberg
Deputy Director: Aric C. Meyer

Overview

The NYU Tandon School of Engineering Master's Degree Program in Management of Technology (MOT) was created for professionals who aim to make a difference in an economy where bridging the technology and business worlds is crucial. It introduces participants to the latest thinking and best practices in technology management and innovation. For forward-thinking managers, the MOT Program is a proven and unique path to leadership in the Twenty-First Century.

One of the first accredited universities to offer an advanced degree in MOT, the NYU Tandon School of Engineering is a recognized leader in the field, and has offered the MOT program for almost two decades. Rather than grafting a few courses onto a traditional MBA program, the MOT Program possesses a thoroughly innovative integrated curriculum. Whether a student is a recent college graduate, or in the early, middle, or advanced stages of their career, the MS program in Management of Technology at NYU Tandon prepares students to take part in this process of invention, innovation, and entrepreneurship -what we like to call i^2e.

The MOT program also welcomes students into a community of learners that includes faculty, strategic partners, industry leaders and business networks around the world. The Institute for Technology and Enterprise (ITE) - New York's premiere research and educational hub for management and innovation - is one of our major partners. It hosts round-tables and workshops with industry leaders and scholars, ensuring our students benefit from a wealth of resources and ideas.

Key Characteristics of the MOT Program: Flexible Scheduling

The MOT program is offered with a curriculum that bridges the gap between technology and business, and may be completed in accelerated (4), full-time (3), or part-time (2) or (1) formats in anywhere from 10 to 44 months. The number in parentheses represents the number of 3.0 credit courses completed in each semester in each format. Due to this scheduling flexibility, it is well-suited for engineers and scientists with increasing managerial responsibility, as well as professionals, functional and business managers, and entrepreneurs in financial services, IT, security, design, retailing, media/entertainment and other increasingly technological environments. Courses take place in the evening, which means there is minimal disruption to a student's busy daytime routine.

Goals and Objectives

By the time students graduate from the MOT program, they will:

- Possess the tools to analyze strategic and global management issues;
- Be able to apply knowledge of technology and management in diverse settings;
- Understand how to formulate new business models around technology-enabled innovation; and
- Develop the skills and confidence to assume leadership positions in established firms, as well as new ventures.

Admissions Criteria

The MOT program is selective. Candidates must have an undergraduate degree from an institution of higher learning, either in the United States or abroad. Candidates must have a minimum 3.0 grade-point average or equivalent in their undergraduate degree. Candidates are required to take the Graduate Management Admission Test (GMAT) or Graduate Record Examination (GRE). International students must take the TOEFL exam.

Admission to the MOT program is based on an in-depth evaluation of a candidate's academic record, work experience and overall intellectual and professional qualifications and potential. Applicants must demonstrate strong commitment, and an ability to benefit professionally from the program. Because of the heavy demands of this program, it is important that employers also explicitly support such professional education.

Please direct all inquiries to tmi@nyu.edu

Master of Science

Management of Technology, M.S.

Program Description and Purpose

Effective use of technology, leadership, innovation practice and management and entrepreneurship increasingly determine success in business. The Department of Technology Management and Innovation is an acknowledged pioneer and leader in the New York City/tri-state region and beyond in offering courses and programs about these increasingly critical arenas. The department serves a diverse and broad range of professionals, and its faculty and students compose a vital and forward-thinking research and learning community. The department's research and educational offerings focus on a broad range of industry sectors, including financial and professional services; information technology, renewable energy and clean technology as well as non-profits and government-all constituting areas of greatest growth and opportunity in the modern economy, especially in New York City, the nation's foremost global city.

The NYU Tandon School of Engineering Master's Degree Program in Management of Technology (MOT) was created for professionals who aim to make a difference in an economy where connecting the technology and business worlds is crucial. It introduces participants to the latest thinking and best practices in technology management and innovation. For forward-thinking managers, the MOT Program is a proven and unique path to leadership, innovation, entrepreneurship, design thinking, and creativity in the Twenty-First Century.

Program Structure and Curriculum

The MOT Program comprises 12 courses (see listing below) totaling 36 credits. Courses for the MOT program are held on weekday evenings and on Saturdays at 55 Broad Street in Lower Manhattan and on weekday evenings at the Brooklyn campus of the School of Engineering. Fulltime students may complete this MS program in 10 calendar months by completing 4 courses per semester for 3 semesters, or in 15 calendar months by completing 3 courses per semester for 4 semesters. Part-time students may take from one to two courses per semester, completing the program in 22 to 44 calendar months. Participants who complete the MOT Program receive a Master of Science degree in Management of Technology.

For the most current information: https://engineering.nyu.edu/academics/programs/management-technology-ms

The MOT program's series of required courses provide participants with a deep understanding of the foundations of managerial competencies needed to manage innovation in the evolving business environment. In addition, participants can choose electives from the Department of Technology Management and Innovation or from other areas of the School that can enhance their understanding of a particular area of interest in the broadly defined arena of technology management.

Courses

The MS MOT 36-credit curriculum consists of 12 three-credit courses:

- Management Core courses (12 credits)
- Technology Management Tools (9 credits)
- Elective courses (12 credits)
- Capstone (3 credits)

Required Courses (36 Credits)

Core Business Skills (12 Credits)

- MG-GY 6013 Organizational Behavior *3 Credits*
- MG-GY 6023 Economics & Strategy *3 Credits*
- MG-GY 6033 Financial Analysis for Tech Managers *3 Credits*
- MG-GY 7953 Global Innovation *3 Credits*

Technology Management Tools (9 Credits)

Select 3 of the following courses:

- MG-GY 6183 Communication for Technology Managers *3 Credits*
- MG-GY 6193 Statistics for Data Analysts *3 Credits*
- MG-GY 6203 Data Visualization for Business Intelligence *3 Credits*
- MG-GY 6303 Operations Management *3 Credits*
- MG-GY 6933 Information Technologies, Systems and Management in Organizations *3 Credits*

- MG-GY 8203 Project Management *3 Credits*
- MG-GY 8213 Information Security and Privacy for Managers *3 Credits*
- MG-GY 8303 Human Resource Management Systems *3 Credits*
- MG-GY 8363 Fundamentals of Information Security Management *3 Credits*
- MG-GY 9683 Internship and Action Learning *3 Credits*
- CP-GY 9911 Internship for MS I *1.5 Credits*
- or CP-GY 9921 Internship for MS II *1.5 Credits*

Elective Courses (12 Credits)

Continue creating a self-customized curriculum by organizing electives into "*Knowledge Areas*." These informal technology-based specializations reflect the recent directional advances in the field. However, students may elect a unique focus by creating a curriculum that includes courses across the prescribed Knowledge Areas: Global Tech Strategy, Business Design, Project Management, Data Analytics, Human Capital Engineering and Analytics. Please visit the Department webpage for the most recent elective offerings in these Knowledge Areas: https://engineering.nyu.edu/academics/programs/management-technology-ms-campus

Capstone Experience (3 Credits)

- MG-GY 9503 MOT Capstone Project Course *3 Credits*
  or
- MG-GY 9703 Project in Strategy and Innovation *3 Credits*
  or
- MG-GY 997X MS Thesis in Technology Management *3 Credits*

Technology Management

Academic Director: Oded Nov

Modern technologies are redefining products, services, processes, organizational forms, business models and industry structures. Understanding the managerial implications of these technologies has become a fastgrowing and highly important arena for business research. High-quality scholars, capable researchers and expert professionals are needed to expand the knowledge base in technology management through significant intellectual and educational contributions. Additionally, these developments have created a huge international demand for new kinds of managers who can strategically integrate technology and management to innovate and achieve a sustainable competitive advantage for a company. To prepare these managers, qualified educators able to teach technology management are increasingly in demand.

The mission of the Doctor of Philosophy in Technology Management (PhD-TM) Program is to educate and train scholars who will produce first-rate TM research and who will become faculty members in leading universities. The program is focused on quality (max. 3 students recruited per year) and ensures the research production of students through high-quality supervision and training. The program is under the auspices of the Department of Technology Management and Innovation and is offered full time or part time.

Faculty members possess significant research strengths in a diverse range of technology management-related fields. The faculty's major professional commitment is to research, thereby contributing to the theory and practice of technology management in important and fundamental ways.

Located in the high-technology heart of New York City, the PhD-TM Program provides immediate access to the world-leading business community and industries (such as financial services, entertainment and media, health care and pharmaceuticals, publishing, advertising and fashion). This broad industrial base serves as a platform for research, obtaining research support and discovering diverse opportunities for scholarly and educational collaboration.

The Department of Technology Management and Innovation offers a full range of academic programs and knowledge-generation activities, all related to technology management in some essential fashion. These programs include the master's program in Management of Technology (MOT) offered in executive, evening full-time and part-time, and online formats; an advanced certificate in Project Management, and the BS in Business and Technology Management (BTM). Together, these programs create a broad value chain of educational efforts in which courses and students with a strong interest in technology management provide PhD-TM students with a host of opportunities for intellectual and educational experiences.

This terminal degree program is for research-oriented students who are largely interested in research-based positions at academic and research institutions. Universities with undergraduate and graduate programs that emphasize the integration of technology and management are a primary source of career opportunities for PhD-TM graduates. In addition, government agencies, not-forprofit research organizations, corporate research centers and research-based consulting firms also will seek PhD-TM graduates.

For more information, please visit http://engineering.nyu.edu/academics/departments/technology.

Sample Themes

The following are examples of the themes that a PhD-TM student can select:

- Managing Emerging Technologies
- Global Innovation Strategy
- Knowledge management
- Information economics and strategy
- Technology-mediated communication
- Impacts of technology upon individuals, organizations and society
- Social computing
- Service design and innovation
- Impacts of technology upon individuals, organizations and society
- Citizen science
- Behavioral aspects of information systems
- Distributed collaboration and virtual teams

Admission Information

Admission to the PhD-TM Program is based on an in-depth evaluation of an applicant's academic record, professional experience, research potential, interest in doctoral study, and overall intellectual and professional qualifications. Students must submit the following to be considered for admission:

- Application form with required application fee.
- Official transcripts of all previous undergraduate and graduate records indicating a bachelor's degree with at least a B average from an accredited college or university. The transcripts must be sent directly to the Office of Graduate Admissions.
- Official score from either the Graduate Management Aptitude Test (GMAT) or Graduate Record Examination (GRE).
- A minimum score of 90 for the IBT is required for admission.

- Three letters of recommendations from persons qualified to comment on the applicant's aptitude for doctoral study and research. At least two should be from academics.
- A statement of purpose that at least covers why applicants seek the PhD-TM at the NYU Tandon School of Engineering and how well they are prepared for this study.
- A research-based writing sample (minimum of 10 pages). This could be a paper or research project you have worked on in the past.

Note that part-time and full-time students have to submit the same documentation. There is no financial aid available for part-time students.

In some cases, the department contacts applicants for a telephone or personal interview.

In rare cases, the PhD-TM Admissions Committee may admit an applicant who does not meet all required admissions criteria as a nondegree student. Such a student then has a later opportunity to apply for admission to the PhD-TM Program.

Enterprise Learning

NYU Tandon School of Engineering's Enterprise Learning meets the complex needs of large organizations worldwide, helping tie learning to company objectives. Whether organizations need to encourage technical leadership, or provide creative intelligence to run R&D centers, or introduce strategic ways to launch new tools and technologies, it can count on NYU Tandon Enterprise Learning to deliver what management and technical staffs need-wherever they are deployed-online, at company sites, or at NYU Tandon's campuses on every continent. Corporate learning and performance officers or training staff will recognize how these noncredit executive-education certificates meet strategic-learning objectives. For details, go to https://engineering.nyu.edu/academics/degrees-programs/industry-partner-programs.

NYU School of Engineering Enterprise Learning

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NYU Tandon Online

NYU Tandon Online is the fully accredited Online Learning Unit of NYU Tandon School of Engineering. NYU Tandon Online provides global, flexible online education in engineering, science and technology to create industry experts who will impact the nation and the world. This is achieved by carrying on the NYU Tandon School of Engineering culture of Innovation, Invention, and Entrepreneurship. Armed with the tools, resources and inspiration, faculty and students can turn their research into concrete applications, products and services. The online community allows for world-wide collaboration, allowing even the most remote student to be an integral part of the NYU community. The degree earned and the education received is exactly the same as students receive by attending classes on campus.

NYU Tandon Online

Graduate Certificate

Bioinformatics (Online) Advanced Certificate

Emerging from unprecedented investigations into biological phenomena over the last decades, the in-demand field of bioinformatics organizes and translates vast streams of data from living organisms generated by the Human Genome Project and other more recent studies. If you are seeking a role as an expert in bioinformatics, you need a thorough appreciation of biology, chemistry, and computer science. This online graduate certificate prepares you to join a talented cadre of creative specialists in the fast-paced pharmaceutical and biotechnology industries.

Students who earn a Bioinformatics Advanced Certificate may apply those credits (up to nine) towards the Bioinformatics Master's Degree.

Curriculum

4 Required Courses (12 Credits)

Required Core Courses (9 Credits)

- BI-GY 7653 Next Generation Sequence Analysis *3 Credits*

Elective Courses (3 Credits)

Please choose 1 elective.

- BI-GY 7633 Transcriptomics *3 Credits*
- BI-GY 7683 Biology and Biotechnology for Bioinformatics *3 Credits*
- BI-GY 7693 Population Genetics and Evolutionary Biology *3 Credits*
- BI-GY 7733 Translational Genomics and Computational Biology *3 Credits*
- BI-GY 7743 Machine Learning and Data Science for Bioinformatics *3 Credits*
- BI-GY 7673 Applied Biostatistics for Bioinformatics *3 Credits*

Master of Science

Bioinformatics (Online), M.S.

Bioinformatics

The last decade has seen unprecedented changes in biotech, biomedicine, biomanufacturing, and bioengineering. Most of it is fueled by new genomics and other omics technologies that generate massive amount of data, but also do so at a higher and higher resolution going down to single molecules and single cells. The resulting data need to be interpreted carefully, because a single mutation in a base (e.g., "SNP") could be the cause of a disease. The resulting data is massive, as biotech's Moore's law grows exponentially (doubling every five months in comparison to computers' doubling every eighteen months).

We at Tandon are educating and nurturing tomorrow's biotech rock-stars, who can address infectious diseases (e.g., Zika or Ebola), genetic diseases (e.g., Cancer, Alzheimer or Autism), public health (Personalized Health Care Program, Diabetes or Obesity), agriculture (e.g., GMO, Genetically Modified Organisms) and green technology (e.g., Energy or GHG(Green House Gas)-sequestration.

This NY State approved program meets industry's demand for professionals with solid foundations in genomics, proteomics, and transcriptomics; Algorithms, statistics and biotechnology; programming (Python, Perl and R); data science, AI and ML; sequence and pathway analysis, as well as a host of genome informatics tools and algorithms such as BLAST, BioPython, BioPerl, Bioconductor, and UCSC genome browser.

Tandon also provides a bridge program to prepare students with insufficient background in core computer science before admission.

Students who earn a Bioinformatics Advanced Certificate may apply those credits towards the Bioinformatics Master's Degree. Note that only 9 credits from the Advanced Certificate can be used towards the Bioinformatics Master Degree program.

Required Core Courses (18 Credits)

- BI-GY 7453 Algorithms and Data Structures for Bioinformatics *3 Credits*
- BI-GY 7663 Problem Solving For Bioinformatics *3 Credits*
- BI-GY 7673 Applied Biostatistics for Bioinformatics *3 Credits*
- BI-GY 7683 Biology and Biotechnology for Bioinformatics *3 Credits*
- BI-GY 7723 Statistics and Mathematics for Bioinformatics *3 Credits*
- BI-GY 7743 Machine Learning and Data Science for Bioinformatics *3 Credits*

Choose a Concentration (6 Credits)

Laboratory Science Concentration (Required Courses):

- BI-GY 7543 Proteomics *3 Credits*
- BI-GY 7653 Next Generation Sequence Analysis *3 Credits*

Translational Science Concentration (Required Courses):

- BI-GY 7693 Population Genetics and Evolutionary Biology *3 Credits*
- BI-GY 7733 Translational Genomics and Computational Biology *3 Credits*

Electives

- BI-GY 7573 Special Topics in Informatics in Chemical and Biological Sciences *3 Credits*
- BI-GY 7633 Transcriptomics *3 Credits*

Minimum Total: 30 Credits

Computer Engineering (Online), M.S.

Description

Computer engineers participate in some of the most forward-looking work in industry and government today, particularly telecommunications, computer networks and microelectronics. Students become resourceful experts in such dynamic fields as computer networks, VLSI design and testing, embedded systems design and computer architecture. Focusing on principles and concepts underlying the design and integration of hardware and software components and systems, this online master's in computer engineering gives students what they must know to become serious professionals, practitioners confident in electronically controlled systems and devices.

Group 1 (6 Credits): Required Courses

Core Courses-Choose 3 Out of Following

- ECE-GY 6473 Introduction to VLSI System Design *3 Credits*
- ECE-GY 6463 Advanced Hardware Design *3 Credits*
- CS-GY 6133 Computer Architecture I *3 Credits*

Group 2 (21 Credits)

Other graduate ECE and CSE courses (courses with ECE and CS prefixes). With adviser approval up to two courses pertinent to computer engineering can be taken from other departments at NYU.

Group 3 (3 Credits): Project Requirement

One 3-credit advanced project in ECE/CSE (ECE-GY 9953 or CS-GY 9963) is required.

MS Thesis Option (6 Credits)

A thesis in ECE/CSE (ECE-GY 997x/CS-GY 997X) may be selected to replace the 3-credit Advanced Project and a course from Group 2 above.

Transfer Credits

No transfer credits are accepted towards the MS degree.

Minimum Total: 30 Credits

Cybersecurity (Online), M.S.

Cybersecurity

As the demand for skilled information-security professionals continues to grow, computer and network professionals now can turn to this online, in-demand master's to emerge as sophisticated practitioners in cybersecurity, the science of protecting vital computer networks and electronic infrastructures from attack. Students acquire a solid foundation in key technologies-computer and network security, digital forensics, cryptography and biometrics. They study with internationally recognized faculty from the Information Systems and Internet Security (ISIS) Laboratory. With industry continuing to place top priority on safeguarding its data and information systems, students become well prepared for careers in developing security products, as security-application programmers, security analysts, penetration testers, vulnerability analysts and security architects.

Required Computer Science Courses: 3 Credits each

- CS-GY 6033 Design and Analysis of Algorithms I *3 Credits*
- CS-GY 6233 Introduction to Operating Systems *3 Credits*
- CS-GY 6843 Computer Networking *3 Credits*

Required Security Core Courses: 3 Credits each

- CS-GY 6813 Information, Security and Privacy *3 Credits*
- CS-GY 6823 Network Security *3 Credits*
- CS-GY 6903 Applied Cryptography *3 Credits*
- CS-GY 9163 Application Security *3 Credits*

Select Any 3 Electives: 3 Credits each

- CS-GY 6573 Penetration Testing and Vulnerability Analysis *3 Credits*
- CS-GY 6803 Information Systems Security Engineering and Management *3 Credits*
- CS-GY 9093 Biometrics *3 Credits*
- CS-GY 6963 Digital Forensics *3 Credits*
- CS-GY 9963 Advanced Project in Computer Science *3 Credits* (in the area of cybersecurity)
- CS-GY 6243 Operating Systems II *3 Credits*
- CS-GY 6043 Design and Analysis of Algorithms II *3 Credits*
- CS-GY 6133 Computer Architecture I *3 Credits*
- **Research Project (Optional)**
- **Master's Thesis (Optional)**

Minimum Total: 30 Credits

Industrial Engineering (Online), M.S.

Description

Industrial engineers are key professionals who explore how industrial systems work and spearhead effective and efficient delivery of quality products and services. In this online Master of Science in Industrial Engineering, students learn to exploit analytic modeling, system simulation, queuing systems, work design, project planning, facilities design and quality management and control, practices that are fast becoming essential in global industry.

Required Core Courses: 12 Credits

- IE-GY 6113 Quality Control and Improvement *3 Credits*

- IE-GY 6213 Facility Planning and Design *3 Credits*
- IE-GY 6823 Factory Simulation *3 Credits*
- MN-GY 7893 Production Science *3 Credits*

Additional Requirements

- 9 Credits with Either IE or MN Designation
- Elective 9 credits (course selection optional)

Minimum Total: 30 Credits

Management of Technology (Online), M.S.

If you are looking to make a difference in the new digital economy, where bridging the gap between management and technology is crucial, you should enroll in NYU Tandon School of Engineering's online Master's in Management of Technology (MOT). If you are a mid-career manager or member of a technical staff, the program is technology based and industry-driven, allowing you to create and deliver value to your organization.

MOT is your unique path to management, leadership, innovation, entrepreneurship, design thinking, and creativity for 21st century leaders. Encompassing a broad range of industry sectors, the degree is your fast track to high-tech leadership.

Business and Technology Required Core Courses (12 Credits)

- MG-GY 6013 Organizational Behavior *3 Credits*
- MG-GY 6023 Economics & Strategy *3 Credits*
- MG-GY 6033 Financial Analysis for Tech Managers *3 Credits*
- MG-GY 7953 Global Innovation *3 Credits*

Technology Management Tools (9 Credits Required)

Must take **any three** from the following menu:

- MG-GY 6933 Information Technologies, Systems and Management in Organizations *3 Credits*
- MG-GY 6303 Operations Management *3 Credits*
- MG-GY 8203 Project Management *3 Credits*
- MG-GY 6183 Communication for Technology Managers *3 Credits (Business Analytics)*
- MG-GY 6183 Communication for Technology Managers *3 Credits (Communications for Tech Managers)*

Electives (12 Credits)

Can take both 1.5 credits and 3 credits courses totaling up to 12 credits (including internships).

Capstone Experience (3 Credits Required)

Must take **one** of the following:

- MG-GY 9503 MOT Capstone Project Course *3 Credits*
- MG-GY 9703 Project in Strategy and Innovation *3 Credits*
- MG-GY 6183 Communication for Technology Managers *3 Credits*
- MG-GY 997X MS Thesis in Technology Management *3 Credits*

Total Credits Required: 36

General Engineering

Goals and Objectives

A prime mission of the NYU Tandon School of Engineering's first-year college experience is to teach students how to learn. Students will be equipped for life in our rapidly changing world, where it is especially true in the science and engineering studies that education is a lifetime commitment. NYU Tandon's first-year curriculum emphasizes learning by doing through the repeated application of new concepts and skills in practical situations of increasing complexity and sophistication. Faculty leadership of learning by doing involves mentoring of individual students, exploring different learning styles, encouraging working in teams on real professional problems, and modeling what it means to be a superb professional and an involved citizen.

Required Courses

All first-year students, including transfer students with fewer than 6 credits, are required to enroll in EG-UY 1001, the Engineering and Technology Forum course. Students majoring in engineering and technology disciplines will also enroll in EG-UY 1003, a hands-on engineering analysis and design course in their first semester of study at Tandon. In this course, students engage in relevant engineering design projects.Through active involvement and teamwork, students follow practices and approaches used in industry and research entities to solve real-world engineering problems.

Faculty

Industry Professors

Gunter Georgi, PE, Industry Professor, Director of General Engineering

ME, Columbia University

MSME, Columbia University

BSME, Cooper Union

Dimitri James Cordista, Industry Assistant Professor

BSIE, Polytechnic University

David Lefer, Industry Associate Professor, Director of the Engineering and Technology Forum

MS, Columbia University

Peter Li, Industry Assistant Professor

BSCS, Polytechnic University

Jack Bringardner, Industry Assistant Professor

BSCE, The Ohio State University

MS, The University of Texas at Austin

PhD, The University of Texas at Austin

List of Academic Programs and Curricula

Explore the typical course of study and other requirements for each academic program.

Non-Degree

Aerospace Engineering Minor

The Department of Mechanical and Aerospace Engineering offers a minor in Aerospace Engineering that consists of the following five courses, totaling 15 credits, which provide students with the foundation needed to pursue a career in the aerospace industry or graduate studies in the field:

Required Courses:

- ME-UY 3213 Mechanics of Materials *3 Credits*
- AE-UY 4603 Compressible Flow *3 Credits*
- AE-UY 4613 Aerodynamics *3 Credits*
- AE-UY 4633 Aerospace Propulsion *3 Credits*
- AE-UY 4653 Aircraft Flight Mechanics *3 Credits*

Note:

Students pursuing the BS in Mechanical engineering degree may complete the aerospace engineering minor by taking the four AE designated courses in place of two STEM[2] and two Free Electives available in the program. Please see Mechanical Engineering, Aerospace Minor, B.S. for more details.

In order for the Minor to be awarded and recorded on the official student transcript, the student has to obtain an overall 2.00 GPA in the Minor courses.

Contact Information:

Departmental Adviser: Joseph Borowiec

borowiec@nyu.edu

Applied Physics Minor

The Applied Physics Department offers a Minor in Applied Physics which consists of a set of 4 or more physics courses totaling at least 15 credits. The courses should be at the intermediate or advanced level (i.e. any course listed after PH-UY 2033) and have the introductory physics sequence* as prerequisites. You must also earn an overall GPA of 2.0 in these courses to receive the minor. Transfer students must earn at least 8 credits with a 2.0 GPA at the School of Engineering.

*PH-UY 1013, PH-UY 2023, PH-UY 2033, PH-UY 2121, and PH-UY 2131.

Contact Information:

Departmental Adviser: Lorcan Folan

folan@nyu.edu

Biomechanical and Biosystems Engineering Minor

The field of Biomedical Engineering (BME)/Bioengineering is at the interface of engineering, life sciences, technology, and medicine, and has been articulated as an ever more prominent field in the engineering and medical sciences. Engineers working in this specialty apply engineering principles to the medical and biological sciences to design and develop equipment, devices, computer systems, software, and molecular and cellular engineering tools used in the medical, biotechnological, and pharmaceutical fields.

The Minor was designed to provide students with a basic proficiency in fundamental core areas in the field of BME/Bioengineering. Students are required to take a total of 16 credits satisfied by five core courses in the Minor, as shown below. BMS-UY 1004 is an established course. All ME courses offered in this track are new.

Required Courses:

- BMS-UY 1004 Introduction to Cell and Molecular Biology *4 Credits*
- ME-UY 4623 Biomechanics *3 Credits*
- ME-UY 4633 Biomaterials *3 Credits*
- ME-UY 4643 Biofluid Mechanics *3 Credits*
- ME-UY 4653 Introduction to BioMEMS and Microfluidics *3 Credits*

Note:

In order for the Minor to be awarded and recorded on the official student transcript, the student has to obtain an overall 2.00 GPA in the Minor courses.

Contact Information:

Departmental Adviser: Joseph Borowiec

borowiec@nyu.edu

Biomolecular Science Minor

Students may obtain a minor in Biomolecular Science by taking 15 credits of BMS or CM courses chosen in consultation with a BMS advisor, not including those courses required by their major. At least 8 of the 15 credits must be taken at the NYU Tandon School of Engineering.

Contact Information

Bruce Garetz
bgaretz@nyu.edu

Computer Engineering Minor

Required Courses

Students may obtain a minor in Computer Engineering by taking the following courses:

- ECE-UY 2004 Fundamentals of Electric Circuits *4 Credits*
- CS-UY 2204 Digital Logic and State Machine Design *4 Credits*
- ECE-UY 4144 Introduction to Embedded Systems Design *4 Credits*
- CS-UY 2124 Object Oriented Programming *4 Credits*
  OR
  ECE-UY 3114 Fundamentals of Electronics I *4 Credits*
  (whichever is not required for the student's primary degree program)

Total Credits: 16

Note:

For students not earning the BS degree in computer science, ECE-UY 4144 may be replaced by CS-UY 2214 Computer Architecture. Students should be aware of the prerequisites for the courses for the minor. A GPA of 2.0 or better in the entire minor is required. Students must take a minimum of 8 credits at the School of Engineering. The minor in computer engineering is not open to students earning the BS degree in electrical engineering.

Contact Information:

Departmental Adviser: Richard Toth

rtoth@nyu.edu

Computer Science Minor

The minor in Computer Science consists of a minimum of 15 credits including CS-UY 1134 and CS-UY 2124.[1] Students must obtain a grade of C- or better in CS-UY 1114 (Intro. to Programming and Problem Solving) or CS-UY 1123 Problem Solving and Programming II or a grade of A- or better in CS-UY 1133 or permission of the department and satisfy the pre-requisite requirements before enrolling in these courses.[2]

Students must maintain an average of 2.0 or better in the entire minor. In addition, a required CS course in a BS curriculum cannot be used to satisfy the course requirements in the CS minor. For transfer students, a least three of the five courses must be taken at the NYU Tandon School of Engineering.

For more information about the minor, contact the Computer Science Department's undergraduate academic adviser.

[1] Students who entered NYU Tandon prior to FA16 may take CS-UY 1124 Object Oriented Programming and CS-UY 2134 Data Structures and Algorithms instead of CS-UY 1134 and CS-UY 2124.

[2] CS-UY 1113, 1123, 1114, and CS-UY 1133 do not count toward the minor requirements.

Construction Management Minor

Much of what is designed by civil engineers is intended to be built or constructed in some manner. The goals of the minor are to teach fundamental technical and leadership skills and promote a greater understanding of relationships among construction and the other professions to students from the various engineering disciplines and other majors who may in some way become involved in the planning, construction, maintenance or operation of built systems. For this reason, the minor is open to any courses within the undergraduate Construction Management program (subject to the within described credit and course prerequisites), and it will allow students to select courses that best fit their interests and complement their curricula.

A basic understanding of construction is necessary to take full advantage of the courses in the Construction Management curriculum. CE-UY 1502 Leadership and Foundations of Construction Management (formerly CE 1504) is the first major course in the Construction Management curriculum and serves as the introduction to major course for the program. CE-UY 1502 is a prerequisite to all other undergraduate Construction Management courses, except CE-UY 4533 Construction Law. This prerequisite can also be satisfied by an appropriate introduction to major course in another curriculum, such as CE-UY 1002 Introduction to Civil Engineering. The determination as to whether any other course may satisfy this prerequisite is subject to the evaluation and approval of the Construction Management Program Director. In addition, students who have taken CE-UY 1002 (or its predecessor course) or another acceptable prerequisite may take CE-UY 1502 (or have taken its predecessor course) with the approval of the Construction Management Program Director in satisfaction of the minor requirement. All other prerequisites shall be as stated in the Bulletin. CE-UY 2533 Construction Project Management and one additional CE-UY 25xx course are also required for the minor.

The individual courses taken to fulfill the requirements of the minor each may be 1, 2, 3 or 4 credits. Students must earn a passing grade in not less than five courses and not less than 14 credits.

Note: The above prerequisites are effective for students first enrolled in or after Fall 2018. See prior editions of the Bulletin for prerequisites applicable to students first enrolled prior to Fall 2018.

Contact Information:

Departmental Adviser: Lawrence Chiarelli

lchiarelli@nyu.edu

Cybersecurity Minor

Overview:

Interested in understanding how systems can be hacked? Interested in understanding how systems can be designed to prevent them from being hacked? Want to understand how the latest reflection attack exploits have taken down entire systems? Want to learn the right areas of Computer Security to help you have relevant and useful skills for entering a growing field of industry? This minor may be of interest to you.

The CSE Department has been designated as a Center for Excellence in Cybersecurity Education and Research by the NSA and has an active cadre of students specializing in Cybersecurity, some of whom are supported by the NSF through it's Scholarships for Service program. The minor program focuses on the technical aspects of security systems and is geared for those who are enrolled in a technical program in Computer Science or a related field. It covers, at a detailed level, technology that is used to detect security violations, technology that is used to build security appliances, and technology that is used to secure applications.

The program is unique within the NYU academic community and will be of interest to many students majoring in the NYU Tandon School of Engineering's BS programs in Computer Science and Computer Engineering. It may also be appealing to some students in the CAS BA program in Computer Science or related programs.

Students taking the minor must complete several prerequisite NYU Tandon School of Engineering Math and Computer Science courses (or similar courses offered by Courant). The minor requirements then comprise five security related courses. Students may count CS / EE courses in the minor as CS / EE electives in the BS degree programs in Computer Science and Computer Engineering.

Cybersecurity is focused on the technical aspects of security systems and geared for those who are enrolled in a technical program in Computer Science or related field. It covers at a detailed level technology that is used to detect security violations, technology that is used to build security appliances and technology that is used to secure applications. This minor is geared towards students who want to work in a technical field of security such as penetration testing or developing secure applications or who plan to go onto graduate education in security. Inquiries should be directed to the coordinator of academic advising, Susana Garcia-Henriquez.

Cybersecurity Minor (15 credits):

Prerequisites:

Students will be expected to complete a minimal core curriculum (knowledge of programming, data structures, discrete math, and some computer architecture) in the CS undergraduate program, before enrolling in this minor, in order to be well prepared for the security coursework. Students who would like to pursue this minor who are not also CS majors will have to complete these courses (or show equivalent mastery) in addition to the minor requirements.The typical pathway through the pre-requisite chain for NYU Tandon School of Engineering students will include the following five courses:

CS-UY 1114 Introduction to Programming and Problem Solving
CS-UY 1134 Data Structures and Algorithms*
CS-UY 2124 Object Oriented Programming*

*Note**:** *Students who entered NYU Tandon prior to FA16 may take* CS-UY 1124 Object Oriented Programming and CS-UY 2134 Data Structures and Algorithms *instead of CS-UY 1134 and CS-UY 2124.*

MA-UY 2314 Discrete Mathematics
CS-UY 2214 Computer Architecture and Organization

NYU Tandon School of Engineering Computer Science or Computer Engineering majors can take CS-UY 3224 Operating Systems as a co-requisite with CS-UY 3923 Computer Security.

Alternatively, students may satisfy most of the pre-requisites with courses in the College of Arts and Sciences:

CSCI-UA.0002 or placement exam
CSCI-UA.0101 (Introduction to Computer Science)
CSCI-UA.0102 (Data Structures)
CSCI-UA.0201 Computer Systems Organization)
MATH-UA.0120 (Discrete Mathematics).

These prerequisites can be completed by the fourth or fifth semester, leaving 3-4 semesters to complete the minor. Some courses require other security courses as prerequisites. Students should be sure to fulfill all necessary course requirements.

Cybersecurity Minor Courses:

This minor consists of 15 credit units: four required 3-credit courses and one 3-credit elective.

Cybersecurity Minor Required Core (12 credits):

- CS-UY 3923 Computer Security *3 Credits*
- CS-UY 3933 Network Security *3 Credits*
- CS-UY 4753 Application Security *3 Credits*
- CS-UY 4793 Computer Networking *3 Credits* **OR** ECE-UY 3613 Communication Networks

Cybersecurity Minor Electives (3 Credits):

In addition to these four core courses, students must take 3 additional credits from the following security courses from the NYU Tandon School of Engineering CS curriculum and from university-wide electives. Course options include:

NYU Tandon SOE Security Courses

- CS-UY 4763 Information Systems Security Engineering and Management *3 Credits*
- CS-UY 4773 Penetration Testing and Vulnerability Analysis *3 Credits*
- CS-UY 4783 Applied Cryptography *3 Credits*
- EL-GY 9423 Computer Electronic Devices and System: Intro to Hardware Security & Trust *3 Credits*

University-wide Electives:

Students may take a security related elective from outside the NYU Tandon School of Engineering with permission of the program director. Students who are doing a security related senior design project may use this as one elective in the Cybersecurity minor.

Suggested Sequence of Courses:

Computer Security (CS-UY 3923) can be taken at the same time as *Operating Systems* (5th semester of study for students entering CS BS program without advanced placement). Computer Security is a prerequisite for *Application Security (CS-UY 4753)*. *Computer Networking (CS-UY 4793)* can be taken as early as the 4th semester, once the student has completed *Data Structures & Algorithms (CS-UY 2134)* and *Object-Oriented Programming (CS-UY 2124)*. *Computer Networking* is a prerequisite for *Network Security (CS-UY 3933)*, which, in turn, is a prerequisite for certain, more advanced electives. Students are advised to take these core courses during the junior year and/or first semester of the senior year, and then to take remaining security electives during the senior year.

CAS students who plan to take the cybersecurity minor should be aware that the minor will require them to take at least four courses (12 credits) at the NYU Tandon School of Engineering and that there is a limit (four courses or 16 credits) on the number of courses they may take outside of CAS. Thus, they must plan their programs carefully.

Electrical Engineering Minor

Students may obtain a minor in Electrical Engineering by taking 15 credits of ECE prefixed courses. The courses may be any ECE course subject only to the prerequisite requirements. A GPA of 2.0 or better in the entire minor is required. Also, a grade of C- or better is required in Circuits (ECE-UY 2004).

A minimum of 8 credits in the minor must be taken at the School of Engineering. The Electrical Engineering minor is not open to Computer Engineering students.

Contact Information:

Departmental Adviser: Richard Toth

rtoth@nyu.edu

English Minor for Tandon Students

Tandon students may earn a minor in English under an arrangement between NYU Tandon's Technology, Culture, and Society Department and NYU's College of Arts and Sciences English Department. This minor is especially designed for Tandon students to allow for the particular demands of completing a Tandon degree. It should be noted that the requirements for the Tandon English minor are different from those of a CAS English minor.

Students must declare their intent to pursue the Tandon English minor with the CAS English Department so that the minor will be recorded on their Albert transcript. Complete the declaration form on this link: https://drive.google.com/file/d/1as2_ZAndOu1z_1vB5_5ZEsq181SE4ctw/view?usp=sharing

Send or deliver it to Mary Mezzano, mm8370@nyu.edu, CAS English Department: 244 Greene Street, Washington Square

For more information, students may consult the following links:

- Tandon TCS website: https://engineering.nyu.edu/academics/departments/technology-culture-and-society
- CAS English Department: http://as.nyu.edu/english/undergraduate/program-of-study-cas-bulletin.html

Requirements are five courses all to be completed with a grade of C or better:

- The second-semester Expository Writing course, The Advanced College Essay, EXPOS-UA 2
- Three English literature electives from Tandon or CAS with the prefixes EN-UY or ENGL-UA
- The CAS Introduction to the Study of Literature course, ENGL-UA 101

Environmental Engineering Minor

Environmental engineers play an important role in designing and implementing projects that protect public health and ecosystems, and therefore play an important societal role in our highly impacted and changing world. The goal of the Civil and Urban Engineering undergraduate minor in Environmental Engineering is to expose undergraduate students to the fundamental principles of environmental engineering theory and practice, which can be applied to solving practical problems that involve evaluation and treatment of contaminated water, soils, and air. Students will develop knowledge and skills in mass and energy balances, reactor models, unit treatment processes, environmental chemistry and microbiology, water resource engineering, hydrology, and environmental contaminants. These skills, along with an emphasis on building analytical reasoning and critical thinking capabilities, can be applied to problem-solving in environmental engineering or additional engineering domains. Students are required to take a total of 15 credits.

The minor is open to all undergraduate students. BS CE students are expected to be able to complete the minor within the required 129 credits.

Learning Objectives of the Environmental Engineering Minor:

- Introduce students to the field of environmental engineering.
- Build foundational skills in mass and energy balances, reactor models, unit treatment processes, environmental chemistry and microbiology, water resource engineering, and hydrology.
- Understand current environmental challenges and environmental health risks, on local and global scales.
- Apply science and engineering principles, and knowledge of environmental regulations, to evaluate current issues in water, soil and air pollution.
- Analyze major unit processes in water, soil, and air treatment systems, and design unit operations to mitigate contaminants in the environment.
- Quantify fluid flow and contaminant transport in the natural environment.
- Enhance problem-solving capabilities and analytical reasoning skills.

Course Requirements

Minor Prerequisites:

- CE-UY 2213 Fluid Mechanics and Hydraulics *3 Credits* (or CBE-UY 3313 or ME-UY 3313 or equivalent)*
- CM-UY 1004 General Chemistry for Engineers *4 Credits* (or CM-UY 1014 or CHEM-UA125 or equivalent)*

Core Courses:

- CE-UY 3223 Introduction to Environmental Engineering *3 Credits* *
- CE-UY 3233 Environmental Engineering Process Design *3 Credits*
- CE-UY 3243 Water Resources Engineering *3 Credits* *
  *CE students currently take these courses as part of their major.

Electives (take two courses from the lists below):

Undergraduate electives:

- CE-UY 3253 Environmental Chemistry and Microbiology *3 Credits*
- CE-UY 4213 Green Infrastructure Design *3 Credits*

Note

Graduate environmental engineering courses may be substituted for the above electives for students with a cumulative GPA> 3.0 with the approval of both the undergraduate academic adviser and the environmental engineering graduate program adviser.

In order for the Minor to be awarded and recorded on the official student transcript, the student has to obtain an overall 2.00 GPA in the Minor courses.

NYU Catalog description of a "Minor"

A minor is an approved coherent concentration of academic study within a single discipline. In specified programs, undergraduate students may select a minor in a field distinct from or related to their major, with approval of advisers in both the major and minor fields. The name of the minor will appear on students' trasncripts if the approved 15 credits in the minor field have been completed with at least a 2.0 GPA. With the consent of a student's major department, some of the courses used to satisfy the minor requirements may also satisfy the required or electives course requirements in the student's major program.

Feminism and Science, Technology, Engineering and Math (FSTEM) Minor

The Feminism and Science, Technology, Engineering and Math (FSTEM) minor trains students to have a critical understanding of the ways that difference and diversity, including gender, race, nationality, class, and ability, shape and are shaped by modern science and technology. Courses for the minor introduce students to the history of women in STEM, the construction of scientific theories of gender and racial difference, queer theory, designing for diversity, and the relationship between gender and disability. Feminist and other student-centered pedagogies encourage students to connect course content to the real world through in-class activities, independent research, writing assignments, engagement with community organizations, and design briefs.

In contemporary STEM fields, professionals must be equipped with the knowledge and tools to identify and decrease bias and unfairness in the design of technical systems, like AI and large-scale infrastructure projects. This minor, open to all Tandon students, prepares students to face these challenges head on and change the world for the better.

The minor consists of 16 credits, or 4 courses, offered by the TCS department. There is 1 required course, Introduction to FSTEM. The other 3 should be chosen from the list below.

Curriculum

Required Course

- STS-UY 2284 Introduction to FSTEM *4 Credits*

List of Approved Courses

- CAM-UY 2204 Disability Studies *4 Credits*
- STS-UY 2224 Science and Sexuality *4 Credits*
- STS-UY 2334 The Invention of Race *4 Credits*
- STS-UY 2904 Special Topic in STS *4 Credits* (Diversity in Technology*)*

- STS-UY 3204 Science and Difference *4 Credits*
- STS-UY 3214 Science & Feminism *4 Credits*
- STS-UY 3224 Queering Science and Technology *4 Credits*
- DM-UY 9103 Special Topics in Digital Media: Designing the PostNatural
- DM-GY 9103 Special Topics in Digital Media: Designing 'Other' Worlds
- DM-UY 9103 Special Topics in Digital Media: Critical Wearables
- DM-UY 9103 Special Topics in Digital Media: Living With Robots

Finance Minor

The Department of Finance and Risk Engineering offers an Undergraduate Minor in Finance. The intent of this program of study is to allow NYU Tandon School of Engineering undergraduate students in the sciences and engineering to leverage their mathematical talents in a selected number of appropriate courses. This cross-school minor is also open to other NYU students with sufficient mathematic preparedness.

For more information on the Finance Minor, visit:

http://engineering.nyu.edu/academics/departments/finance/minor

You may apply for a minor, or any minor, in Albert in the My Academics section of the Student Center.

Contact Information:

Departmental Adviser: Professor Barry Blecherman

bsb279@nyu.edu

Game Engineering Minor

Introduction

With the increased use of mobile and tablet devices, the global video game market, valued at $78 Billion in 2012*, is experiencing unprecedented growth. Game designers and programmers are in higher demand than ever. As the industry grows and develops, so does our commitment to giving our students full access to the technology and leading information necessary for them to dive headfirst into this exciting area. Imagine working with cutting-edge technology to create one of the world's newest and most popular forms of entertainment. Our Game Engineering Minor gives you that opportunity.

Research at the Game Innovation Lab

The NYU Tandon School of Engineering's Game Innovation Lab provides a dynamic and engaging environment for faculty and the students they mentor to conduct innovative interdisciplinary research on the technical/engineering/science side of games and simulations. Working with industry partners and research facilities internationally, the lab provides opportunities for graduate students (and a handful of advanced undergraduates) who aspire to challenge convention and break barriers within the industry. Sample projects include games with advanced user interface techniques (a surveillance camera-enabled public game, an award-winning smart-phone-based dance battle game), automatic rigging of 3D models, research on games for learning, and playful interfaces for security and authentication purposes.

Prerequisites

Students are required to complete a minimal core curriculum in Computer Science (CS) before enrolling in the minor (or demonstrate equivalent mastery), in order to be well prepared for the game engineering coursework, as well as a Calculus course. Students completing the minor from outside of the NYU Tandon School of Engineering CS major program can request permission to apply a portion of these prerequisite credits to the overall credit total for the minor. At most six credits of the following courses may be applied to the minor (substituting for the University-wide elective and one of the core electives), provided they or an equivalent course **are not required** as part of the students major.

- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- CS-UY 1134 Data Structures and Algorithms *4 Credits* *
- CS-UY 1113 Problem Solving and Programming I *3 Credits*
- CS-UY 1123 Problem Solving and Programming II *3 Credits*
- CS-UY 2124 Object Oriented Programming *4 Credits* *

  ***Note:** Students who entered NYU Tandon prior to FA16 may take CS-UY 1124 Object Oriented Programming and CS-UY 2134 Data Structures and Algorithms instead of CS-UY 1134 and CS-UY 2124.

Curriculum

The Game Engineering Minor emphasizes mastery of computer programming skills relevant to Game Engineering, combined with hands-on practice building games with other in studio-style courses, and electives drawn from NYU's broad offerings in the games domain. Students are also expected to complete a prerequisite core curriculum in Computer Science (CS) to be well prepared for the other courses (or to demontrate equivalent mastery).

Course Distribution

The minor consists of 15 credits. Each course taken may fulfill *either* a core *or* an elective requirement.

Core Course:

- CS-UY 3113 Game Programming *3 Credits* (all students are required to take this course)

Studio Requirement: (choose 1)

- CS-UY 3233 Game Development Studio I *3 Credits*
- CS-UY 4553 Game Design *3 Credits*
- OART-UT 1612 Game Development *3 Credits* (Tisch School of the Arts Game Center)

Core Electives: (choose 2)

Students must take two additional game engineering courses within the NYU Tandon School of Engineering CS curriculum (or equivalent courses from other NYU departments - approval required).

- CS-UY 4533 Interactive Computer Graphics *3 Credits*
- CS-UY 4543 Human Computer Interaction *3 Credits*
- CS-UY 4553 Game Design *3 Credits*
- CS-UY 4613 Artificial Intelligence *3 Credits*

University-wide Electives: (choose 1)

Students may take an additional Core Elective, or submit another Game Engineering-related elective for approval by the Director of the Game Engineering Minor as part of their minor. The Director of the Game Engineering Minor will maintain a list of currently approved electives. Here is a *sample* of relevant NYU-wide electives:

- 3D Graphics Studio I in NYU Engineering's Digital Media program *3 Credits*
- Introduction to Game Design, Game Development Project Studio, and Games 101 in the Tisch School of the Arts Game Center *3 Credits*
- Designing Simultations and Games for Learning in the Steinhardt Digital Media and Design for Learning program *3 Credits*
- Social Multiplayer Games and Computer Games in the Courant Institute Computer Science Department *3 Credits*

Integrated Digital Media Minor

The minor in Integrated Digital Media is intended for students interested in developing their knowledge and practical skills in and around digital media production technology. As with the BS degree in Integrated Digital Media, courses provide theoretical context and also teach hands-on production expertise in various areas, such as digital filmmaking, web design, 3D graphics, game design, and digital audio. This minor is valuable for students who want to seize their own means of production in their primary fields, allowing them to design, create, and publish media content within the intellectual context of digital media in the 21st century.

Structure of the Minor

The IDM minor requires a minimum of 15 credits in DM classes:

- 3 credits in Audio or Visual Foundation Studio
- 12 credits of DM courses at the 1/2/3/4XXX level

Minor Coursework

- DM-UY 1113 Audio Foundation Studio *3 Credits*
- DM-UY 1123 Visual Foundation Studio *3 Credits*
- DM-UY 1133 Creative Coding *3 Credits*
- DM-UY 1143 Ideation & Prototyping *3 Credits*
- DM-UY 2113 Sound Design for Media *3 Credits*
- DM-UY 2123 Narrative Cinema *3 Credits*
- DM-UY 2133 3D Modeling *3 Credits*
- DM-UY 2143 Interaction Design Studio *3 Credits*
- DM-UY 2153 Intro to Game Development *3 Credits*
- DM-UY 2213 User Experience Design (UX) *3 Credits*
- DM-UY 2263 Still and Moving Images *3 Credits*
- DM-UY 2173 Motion Graphics Studio *3 Credits*
- DM-UY 2183 Contemporary Techniques in Digital Photography and Imaging *3 Credits*
- DM-UY 2193 Intro to Web Development *3 Credits*
- DM-UY 3113 Contemporary Techniques in Sound Art *3 Credits*
- DM-UY 3123 Documentary Cinema *3 Credits*
- DM-UY 3133 3D Animation *3 Credits*

- DM-UY 3153 Media in Game Design and Development *3 Credits*
- DM-UY 3183 Photography and Words *3 Credits*
- DM-UY 3193 Dynamic Web Applications *3 Credits*
- DM-UY 4123 Experimental Cinema *3 Credits*
- DM-UY 4133 3D for Interactive Applications *3 Credits*
- DM-UY 4153 Experimental Game Narratives *3 Credits*
- DM-UY 4173 Professional Practices for Creatives *3 Credits*
- DM-UY 4193 Mobile Application Development *3 Credits*

Contact Information:

Departmental Adviser: Eric Maiello

eric.maiello@nyu.edu

Management Minor

Students may obtain an undergraduate minor in management by completing 14 credits of undergraduate (MG) management courses, which must include MG-UY 1002 Foundations of Management. An overall GPA of at least 2.0 must be maintained in these classes. At least 8 of the 14 credits must be taken by students while enrolled at the School of Engineering.

For more information, please reference the BSBTM Program.

Contact Information:

Departmental Adviser: Bohdan Hoshovsky

bh863@nyu.edu

Mathematics Minor

Requirements for Students Entering Tandon Fall 2018 or later:

A student not majoring in math or math/physics can obtain a minor in mathematics by fulfilling the following requirements:

- 16 credits of MA-UY courses
- At least 8 credits of MA-UY courses must be in addition to the major's math requirements
- At least 8 of the 16 credits must be taken while enrolled at Tandon
- Minimum 2.0 minor GPA

All courses used for the Minor in Mathematics must be pre-approved by the Math Department Advisor. Courses with similar content cannot be used towards the minor.

Requirements for Students Entering Tandon Before Fall 2018:

A student not majoring in math or math/physics can obtain a minor in mathematics by fulfilling the following requirements:

- 15 credits of MA-UY courses
- At least 8 credits of MA-UY courses must be in addition to the major's math requirements
- At least 6 of the 8 credits must be taken while enrolled at Tandon
- Must take:
    - MA-UY 4613 Analysis I
    - MA-UY 4623 Analysis II
- Minimum 2.0 minor GPA

Students who entered Tandon before fall 2018 may choose to follow the new requirements listed above.

Mechanical Engineering Minor

The Minor requires students to take a total of 15 credits in Mechanical Engineering courses. Nine of these credits are in three core courses (selected from a list of four courses), while another six credits of two elective courses come from a list of six courses as shown below. If a student has taken an equivalent course in their own major (e.g., Statics in Civil Engineering), that course will not count toward the Minor. In such a case the student will need to complete an approved ME substitute course so that the total number of completed ME courses still equals 15 credits.

Note: In order for the Minor to be awarded and recorded on the official student transcript, the student has to obtain an overall 2.00 GPA in the Minor courses.

Core Courses (choose three out of the listed four):

- ME-UY 2213 Statics *3 Credits*
- ME-UY 3333 Thermodynamics *3 Credits*
- ME-UY 3223 Dynamics *3 Credits*
- ME-UY 2813 Introduction to Materials Science *3 Credits*

Elective Courses (choose two out of the listed six):

- ME-UY 3213 Mechanics of Materials *3 Credits*
- ME-UY 3233 Machine Design *3 Credits*
- ME-UY 3313 Fluid Mechanics *3 Credits*
- ME-UY 3413 Automatic Control *3 Credits*
- ME-UY 3513 Measurement Systems *3 Credits*
- ME-UY 4313 Heat Transfer *3 Credits*

Contact Information:

Departmental Adviser: Joseph Borowiec

borowiec@nyu.edu

Nuclear Sciences and Engineering Concentration

Concentration and Minor in Nuclear Science and Engineering

This interdisciplinary program aims to produce engineering and science graduates who understand clearly the benefits and risks of nuclear technologies and who will seriously consider employment in nuclear industry and government.

Students may obtain an Interdisciplinary Concentration or Minor in Nuclear Science and Engineering, in conjunction with a traditional degree. Those majors include civil, chemical and biological, computer, electrical, financial and risk, or mechanical engineering, or the physical or computational sciences (all are majors currently offered by the NYU Tandon School of Engineering).

Concentration in Nuclear Science and Engineering

The concentration consists of three courses taken typically during the junior and senior years. Students can use the available technical and free electives in their curriculum to take these courses.

- PH-UY 3103 Fundamentals of Applied Nuclear Physics *3 Credits*
- PH-UY 3503 Introduction to Radiation Physics and Dosimetry *3 Credits*
- ME-UY 4373 Introduction to Nuclear Engineering *3 Credits*

Nuclear Sciences and Engineering Interdisciplinary Minor

The Department of Mechanical and Aerospace Engineering, in collaboration with the Department of Applied Physics, offers a minor an Interdisciplinary Minor in Nuclear Sciences and Engineering that consists of the following five courses, totaling 15 credits, that provide students with the foundation needed to pursue a career in the nuclear sciences and engineering industries or graduate studies in the field:

Course Requirements:

Please refer to the Nuclear Sciences and Engineering Minor page for course requirements.

Note:

Students pursuing the BS in Mechanical Engineering degree may complete the Interdisciplinary Minor in Nuclear Sciences and Engineering by taking the five courses as appropriate replacements for STEM[2], Free, and/or Humanities electives.

In order for the Minor to be awarded and recorded on the official student transcript, the student has to obtain an overall 2.00 GPA in the Minor courses.

Contact Information:

Departmental Adviser: Joseph Borowiec

borowiec@nyu.edu

Nuclear Sciences and Engineering Minor

Concentration and Minor in Nuclear Science and Engineering

This interdisciplinary program aims to produce engineering and science graduates who understand clearly the benefits and risks of nuclear technologies and who will seriously consider employment in nuclear industry and government.

Students may obtain an Interdisciplinary Concentration or Minor in Nuclear Science and Engineering, in conjunction with a traditional degree. Those majors include civil, chemical and biological, computer, electrical, financial and risk, or mechanical engineering, or the physical or computational sciences (all are majors currently offered by the NYU Tandon School of Engineering).

Minor in Nuclear Science and Engineering

The core of the minor is the three course concentration.

- PH-UY 3103 Fundamentals of Applied Nuclear Physics *3 Credits*
- PH-UY 3503 Introduction to Radiation Physics and Dosimetry *3 Credits*
- ME-UY 4373 Introduction to Nuclear Engineering *3 Credits*

Electives

The balance of the 15 credits required for the minor shall be selected from the approved elective courses listed below.

Approved elective courses include:

- ECE-UY 2613 Fundamentals of Electric Power Engineering for Non EE Students *3 Credits*
- PS-UY 2724 Human Factors in Engineering Design *4 Credits*
- PH-UY 3513 Nuclear and Radiation Instrumentation and Methods *3 Credits*
- RSK-UY 3593 Probabilistic Risk Assessment *3 Credits*
- ME-UY 4393 Nuclear Power Plant Systems *3 Credits*
- ME-UY 4863 Corrosion and Non-Destructive Evaluation of Materials *3 Credits*

Note:

An overall GPA of 2.0 is required in the courses to earn the minor.

Contact Information:

Departmental Adviser: Lorcan Folan

folan@nyu.edu

Robotics Interdisciplinary Minor

Minor in Robotics

The Minor in Robotics provides students with a foundation in the fundamental areas of the interdisciplinary field of robotics. Together with a degree in engineering or computer science, the Minor in Robotics prepares students for careers and graduate studies in robotics. Students may obtain a Minor in Robotics by taking the following courses.

ROB-UY 2004 Robotic Manipulation and Locomotion
ROB-UY 3203 Robot Vision
ROB-UY 3303 Robot Motion and Planning
ROB-UY 3404 Haptics and Telerobotics in Medicine

In order for the Minor to be awarded and recorded on the official student transcript, the student must obtain an overall 2.00 GPA in the Minor courses.

Prerequisites

The courses for the Minor in Robotics have the following prerequisites in computer science, mathematics, and physics.

1) Computer Science - Introduction to Programming
2) Mathematics - Differential Equations and Linear Algebra
3) Physics - Mechanics

Students at NYU Tandon and other schools of NYU who meet the prerequisites may enroll in ROB-UY courses. Various courses across NYU schools and NYU global campuses satisfy these prerequisites, as follows.

1) The Computer Science prerequisite is satisfied by any of the following: CS-UY 1114 or CS-UY 1113 or CS-UY 1133 or ENGR-UH 1000 or CS-UH 1001 or CSCI-SHU 11 or CSCI-SHU 101.

2) The Mathematics prerequisites is satisfied by a single course covering linear algebra and differential equations: MA-UY 2034 or MATH-SHU 265

or by separate courses in linear algebra:
MA-UY 3034 or MATH-UA 140 or MATH-UH 1022 or MATH-SHU 140

and differential equations:
MA-UY 4204 or MATH-UA 262 or MATH-UH 1024 or MATH-SHU 262

3) The Physics prerequisite is satisfied by any of the following: PH-UY 1013 or PHYS-UA 11 or PHYS-UA 91 or ENGR-UH 2012 or PHYS-SHU 11 or PHYS-SHU 91

Notes

'UH' designates courses offered at NYU-Abu Dhabi
'SHU' designates courses offered at NYU-Shanghai

Contact Information

Students with questions about the Minor in Robotics can contact an Undergraduate Academic Advisor in either the Department of Electrical and Computer Engineering (ECE) or the Department of Mechanical and Aerospace Engineering (MAE).

Robotics Minor

Minor in Robotics

The Minor in Robotics provides students with a foundation in the fundamental areas of the interdisciplinary field of robotics. Together with a degree in engineering or computer science, the Minor in Robotics prepares students for careers and graduate studies in robotics. Students may obtain a Minor in Robotics by taking the following courses.

ROB-UY 2004 Robotic Manipulation and Locomotion
ROB-UY 3203 Robot Vision
ROB-UY 3303 Robot Motion and Planning
ROB-UY 3404 Haptics and Telerobotics in Medicine

In order for the Minor to be awarded and recorded on the official student transcript, the student must obtain an overall 2.00 GPA in the Minor courses.

Prerequisites

The courses for the Minor in Robotics have the following prerequisites in computer science, mathematics, and physics.

1) Computer Science - Introduction to Programming
2) Mathematics - Differential Equations and Linear Algebra
3) Physics - Mechanics

Students at NYU Tandon and other schools of NYU who meet the prerequisites may enroll in ROB-UY courses. Various courses across NYU schools and NYU global campuses satisfy these prerequisites, as follows.

1) The Computer Science prerequisite is satisfied by any of the following: CS-UY 1114 or CS-UY 1113 or CS-UY 1133 or ENGR-UH 1000 or CS-UH 1001 or CSCI-SHU 11 or CSCI-SHU 101.

2) The Mathematics prerequisites is satisfied by a single course covering linear algebra and differential equations: MA-UY 2034 or MATH-SHU 265

or by separate courses in linear algebra:
MA-UY 3034 or MATH-UA 140 or MATH-UH 1022 or MATH-SHU 140

and differential equations:
MA-UY 4204 or MATH-UA 262 or MATH-UH 1024 or MATH-SHU 262

3) The Physics prerequisite is satisfied by any of the following: PH-UY 1013 or PHYS-UA 11 or PHYS-UA 91 or ENGR-UH 2012 or PHYS-SHU 11 or PHYS-SHU 91

Notes

'UH' designates courses offered at NYU-Abu Dhabi
'SHU' designates courses offered at NYU-Shanghai

Contact Information

Students with questions about the Minor in Robotics can contact an Undergraduate Academic Advisor in either the Department of Electrical and Computer Engineering (ECE) or the Department of Mechanical and Aerospace Engineering (MAE).

Science and Technology Studies Minor

The STS minor is open to all NYU majors. It includes 16 credits in STS. One of the core courses in STS must be taken at Tandon.

1. Core Requirement:

Either

- STS-UY 2004 Science, Technology, and Society *4 Credits*

or

- STS-UY 3004W Seminar in Science and Technology Studies *4 Credits*

2. Elective Requirements:

Remaining credit requirements (12 credits) must be satisfied by courses chosen from the STS Cluster of electives from the Department of Technology, Culture and Society department or by approval by the STS advisor. At least one course must taken at Tandon.

Contact Information:

Departmental Adviser: James Lewis

jpl366@nyu.edu

Structural Engineering Minor

Structural engineering is one of the oldest recognized specializations within the civil engineering profession. Buildings, bridges, dams and tunnels are only a few examples of structures upon which our infrastructure is dependent. Structural engineers must have a strong understanding and be capable of both analyzing and designing structural elements and systems. This minor will prepare civil engineering students who intend to pursue a career in structural engineering, as well provide other students a foundation of understanding of structures or a platform from which to pursue further study. Students are required to take a total of 15 credits.

The minor is open to all undergraduate students. BS CE students are expected to be able to complete the minor within the required 129 credits.

Learning Objectives of the Structural Engineering Minor:
• Introduce students to the field of structural engineering.
• Apply science and engineering principles, to analyze and design safe structures
• Ensure all regulations are properly met.
• Ability to use the techniques and modern engineering tools necessary for engineering practice.

Prerequisites

- CE-UY 2133 Engineering Mechanics *3 Credits* *
- CE-UY 2143 Analysis of Determinate Structures *3 Credits* *
- CE-UY 3183 Structural Engineering *3 Credits* *

Core

- CE-UY 3163 Materials for the Built Environment *3 Credits*
- CE-UY 4813 Structural Engineering Capstone *2 Credits* ‡

Select three Electives:

- CE-UY 3123 Dynamics of Extreme Events *3 Credits* †
- CE-UY 3133 Structural Analysis *3 Credits*
- CE-UY 4183 Reinforced Concrete Design *3 Credits* §
- CE-UY 3143 Steel Design *3 Credits* §
- CE-UY 4193 Timber and Masonry Structures *3 Credits*
- CE-UY 4173 Foundation Engineering *3 Credits*

Notes

a. Courses denoted with (*) are taken by all CE students and do not count towards the minor for the CE Students
b. At least one design course denoted with (§) is required.
c. Courses denoted with (†) are required for non-CE Students only
d. Structural Design Capstone (‡) can be used by CE Students to satisfy Capstone II Requirements

Note: This course requires either Reinforced Concrete Design or Steel Design as a prerequisite

Graduate Courses

Certain graduate courses in strutures are allowed for Senior-level Students with cGPA>3.0 and approval of the Structural Engineering Minor adviser.

NYU Catalog description of a "Minor"

A minor is an approved concentration of academic study within a single discipline. In specified programs, undergraduate students may select a minor in a field distinct from, or related to, their major, with approval of advisers in both the major and minor fields. The name of the minor appears on students' transcripts if the approved 14-15 credits in the minor field have been completed with at least a 2.0 GPA. With the consent of a student's major department, some courses used to satisfy the minor requirements also may satisfy the required or electives course requirements in the student's major program.

Sustainable Urban Environments Minor

The program in Sustainable Urban Environments (SUE) prepares students to join scholars, policymakers, and other professionals as they work to create sustainable urban areas. The SUE program combines the liberal arts and technology, to ensure that students are conversant with both the contemporary technical and social problems of sustainability that face cities. Students in the minor can take courses in sustainable cities, urban policy, and city design, as well as courses in civil engineering and infrastructure planning. This minor is open to all NYU majors. Students seeking a minor in SUE must complete at least 16 credits of courses in the program, as described below:

SUE Core Courses

At least two courses from the SUE Core:

- URB-UY 2054W Introduction to Urban Policy *4 Credits*
- HI-UY 3034W History of New York's Urban Infrastructure *4 Credits*
- URB-UY 2024W Design of Cities *4 Credits*
- URB-UY 2044 Methods for Studying Urban Environments *4 Credits*

Remaining Credits

The remaining credits can be from other SUE core courses listed above or any other course with a URB-UY designation.

Contact Information:

Departmental Adviser: James Lewis

jpl366@nyu.edu

Technology, Management and Design Minor

As Design Thinking is ubiquitous throughout the technology landscape regardless of industry, company structure, location and size, the TMD minor's course offerings provide a contemporary, useful and applicable set of technology management tools and inculcates a design-thinking mindset. The TMD minor provides a multi-disciplinary complement, not only for STEM, but for many other disciplines taught at NYU.

TMD prepares students for the professional dual ladder model of "engineering and management" - ascending career positions through the dual rungs of technological prowess+skills, and managerial expertise. As such, TMD "graduates" will be prepared to climb the career ladders facing them and be poised for successes in diverse professional environments. With companies' increasing demand for creative, innovative and collaborative employees, students taking the TMD minor will have the opportunity to develop key skills for their future career: collaboration skills, project experience and a portfolio of innovative techniques. Career prospects range across industries such as technology, finance, healthcare, public service and others.

The TMD Minor is open to all NYU students including students in the Tandon SOE BTM* major.

Structure of the Technology, Management and Design (TMD) Minor:

TMD Required Core Course (4 credits):

- MG-UY 2704 Design Thinking for Creative Problem Solving *4 Credits*

TMD Elective Courses: Choose any 3 from the 4 credit courses below (12 credits total):

- MG-UY 3714 Design Strategies *4 Credits*
- MG-UY 3724 Human-centered Product Design *4 Credits*
- MG-UY 3734 Service Design Innovation *4 Credits*
- MG-UY 4404 Entrepreneurship *4 Credits* **

- MG-UY 4114 Special Topics in Management (4 Cr) *4 Credits* (with a topic specifically announced and designated under the TMD minor, with a pre-req of MG-UY 2704)
- More TMD related MG-UY courses are planned.

TMD Restrictions:

Students may not double count courses between the Tandon SOE Cross School Management Minor*** and this Tandon SOE Minor in Technology, Management and Design and required courses in the Tandon SOE BTM* major.

Notes:

* BTM refers to the Tandon SOE TMI Department's BSc in Business and Technology Management major.

** MG-UY 4404 Entrepreneurship is a degree requirement for BTM* students and therefore is an anti-requisite and cannot be applied towards the TMD Minor. MG-UY 4404 is open to all declared TMD minor students.

*** BTM* students are not eligible to participate in the Tandon SOE Management Minor.

**** BTM majors may only count TMD courses towards BTM Free Electives or in addition to BTM Degree requirements.

Contact Information:

Departmental Adviser: Bohdan Hoshovsky

bh863@nyu.edu

Transportation Minor

Transportation systems continue to be the main driving force behind the on-going race towards building smart cities of tomorrow. In fact, transportation systems are being re-invented, re-engineered, and revolutionized at a rate that has never been seen in the history except the time motorized transportation replaced horse and buggy approximately 100 years ago. The purpose of the Civil and Urban Engineering undergraduate minor in Transportation is to open new avenues to NYU's undergraduate students from all disciplines to be involved in these exciting developments in transportation engineering and planning. The main educational goal is to provide students with the necessary foundations to use advanced analytical techniques and to employ emerging publicly available big data sources not only to analyze and evaluate existing transportation systems but also to plan and engineer future systems such as hyperloop and autonomous vehicles. Students will have the opportunity to learn to use advance simulation and spatial data analysis and visualization tools to assess the effects of implementing alternative designs of these emerging transportation systems. The capstone course will be the culminating experience to work on exciting real-world projects with leading industry and agency partners under the guidance of transportation faculty with a wealth of academic and practical experience in transportation engineering and planning. Students involved in this minor will also have the opportunity to work on exciting research projects lead by the newly established USDOT Tier 1 University Transportation Center, C2SMART (http://c2smart.engineering.nyu.edu) Students are required to take a total of five classes.

The minor is open to undergraduate students. Transportation is a multidisciplinary field and undergraduates from other engineering departments, computer science, planners are all welcome to participate in this minor.

Learning Objectives of the Transportation Minor:

- Introduce students to urban transportation planning principles.
- Develop foundational skills for evaluating transportation facilities.
- Enhance data-driven problem-solving capabilities and analytical reasoning skills.
- Understand how new technologies can be applied to addressing urban transportation challenges

Required Courses

- CE-UY 3313 Introduction to Transportation Systems *3 Credits* OR CE-UY 2343 Transportation Engineering *3 Credits*
- CE-UY 4833 Transportation Engineering Capstone *3 Credits*

Electives

Undergraduate Courses

Students may choose any three elective courses from the following:

- CE-UY 3313 Introduction to Transportation Systems *3 Credits*
- CE-UY 2343 Transportation Engineering *3 Credits*
- CE-UY 3303 Traffic Engineering *3 Credits*
- CE-UY 3333 Transportation Systems and Software *3 Credits*
- CE-UY 3363 Transportation Economics *3 Credits*
- CE-UY 3373 Transportation Systems Analytics *3 Credits*
    - Up to one course from outside the CUE department is allowed to count toward these electives, with approval of the Transportation Minor adviser.

Graduate Courses

Certain graduate courses in transportation, as well as courses from CUSP, are allowed for Junior- or Senior-level Students with cGPA>3.0 and approval of the Transportation Minor adviser.

Contact Information

Departmental Adviser: Joseph Chow

joseph.chow@nyu.edu

Urban Informatics Minor

The academic mission of the proposed undergraduate minor in Urban Informatics is to expose undergraduate students from across the University to the emergent field of data-driven urban studies. This includes the application of data acquisition and analytics to understanding the urban environment, infrastructure, operations, management, policy, design, planning, and population health. The goal is to offer students the necessary foundation to acquire and analyze information to solve critical challenges facing cities in the 21st century. Students will develop skills in data acquisition, data management, analysis, and visualization, as well as in data structure and privacy standards.

The minor is open to students across the University, including those in STEM fields, the humanities, the social sciences, and the arts. Given the cross-disciplinary nature of studies of cities, this minor will be of particular interest to students in disciplines such as sociology, public policy, public health, architecture/urban design, business, economics, and politics. Non-engineering students will gain quantitative skills for deeper understanding of cities in disciplinary areas of interest, while engineering students will benefit from specialized technical electives in data analytics. For both groups, the minor provides skills that are needed for data-driven analysis and critical thinking. This course of study will help prepare students for graduate study in a range of fields, as well as for work in government, the private sector, and nongovernmental organizations that focus on cities and urban living.

Learning Objectives of the Urban Informatics Minor:

- Introduce students to the emerging fields of urban informatics and data science in the context of urban studies.
- Build foundational skills in data modeling, data manipulation, analysis, and visualization.
- Introduce students the applicable data standards for data representation and reasoning.
- Develop computing skills to enable future advanced studies in data applications to engineering.
- Enhance data-driven problem-solving capabilities and analytical reasoning skills.
- Understand how sensing technologies can be applied to better understand urban challenges, including city management and planning, and emergency response.

In consultation and approval of the designated minor advisor, students will select from the following options:

Prerequisite

- MA-UY 2224 Data Analysis *4 Credits* (or equivalent)

Core Course

- CE-UY 4443 Sensing the City: Methods for Urban Health Monitoring *3 Credits*
- CE-UY 4843 Urban and Infrastructure Informatics Capstone *3 Credits*

Electives (Select at least 2 courses)

- CE-UY 3373 Transportation Systems Analytics *3 Credits*
- CE-UY 3123 Dynamics of Extreme Events *3 Credits*
- CS-UY 1134 Data Structures and Algorithms *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
  (Other electives may be used if approved by minor advisor)

Note

In order for the Minor to be awarded and recorded on the official student transcript, the student has to obtain an overall 3.0 GPA in the minor courses.

Contact Information

Minor Advisor: Professor Masoud Ghandehari

masoud@nyu.edu

Bachelor of Science

Applied Physics, B.S.

Bachelor of Science in Applied Physics

Students must complete 128 credits, as defined below, to graduate from the School of Engineering with a Bachelor of Science in Applied Physics. Please note that the curriculum that follows applies to students who began classes in the fall of 2020 or later. If students entered the School of Engineering prior to that date, please consult the curriculum and typical course schedule for students entering spring 2020 or earlier.

The Department of Applied Physics also offers a Minor in Applied Physics and a Concentration and a Minor in Nuclear Science and Engineering. A full list of the department's course offerings is available on the departmental website.

Core Physics Requirements: 36 Credits

- PH-UY 1002 Physics: The Genesis of Technology *2 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- PH-UY 2104 Analytical Mechanics *4 Credits*
- PH-UY 2344 Introduction to Modern and Solid State Physics *4 Credits*
- PH-UY 3002 Junior Physics Laboratory *2 Credits*
- PH-UY 3234 Electricity and Magnetism *4 Credits*
- PH-UY 4124 Thermodynamics and Statistical Physics *4 Credits*
- PH-GY 6673 Quantum Mechanics I *3 Credits*
- PH-UY 4912 Senior Seminar in Physics *2 Credits*

Other Required Courses: 37 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*
- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- MA-UY 2224 Data Analysis *4 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
  or
- CM-UY 1014 General Chemistry I *4 Credits*

- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*

Physics and Math Electives: 21 Credits

Students should select 5 physics elective courses totaling at least 17 Credits, and a 4 credit math elective.

Electives in the Humanities and Social Sciences: 16 Credits

Students must take 16 elective credits in the humanities and social sciences, preferably with EXPOS-UA 2 as a prerequisite. To gain some breadth and depth of knowledge, it is required that students take courses in at least two disciplines and at least one course at an advanced level.

STEM & Free Electives, Project and Independant Study: 18 Credits

Students should take 18 credits of independent study, STEM and free electives. It is strongly recommended that students use 6 of these credits toward a senior project or thesis topic. The program adviser must approve electives selected from other disciplines.

Typical Course Schedule - Applied Physics, BS

Freshman Year

Fall Semester: 15 Credits

- PH-UY 1002 Physics: The Genesis of Technology *2 Credits*
- MA-UY 1024 Calculus I for Engineers *4 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
  or
- CM-UY 1014 General Chemistry I *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*

Spring Semester: 15 Credits

- PH-UY 1013 Mechanics *3 Credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Sophomore Year

Fall Semester: 16 Credits

- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- MA-UY 2224 Data Analysis *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Spring Semester: 16 Credits

- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- PH-UY 2344 Introduction to Modern and Solid State Physics *4 Credits*
- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Junior Year

Fall Semester: 16 Credits

- PH-UY 2104 Analytical Mechanics *4 Credits*
- Physics Elective *4 Credits*
- Math Elective *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Spring Semester: 16 Credits

- PH-UY 3002 Junior Physics Laboratory *2 Credits*
- PH-UY 3234 Electricity and Magnetism *4 Credits*
- Physics Elective *3 Credits*
- STEM Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Senior Year

Fall Semester: 17 Credits

- PH-GY 6673 Quantum Mechanics I *3 Credits*
- PH-UY 4902 Introduction to Senior Project in Physics *2 Credits*
- PH-UY 4912 Senior Seminar in Physics *2 Credits*
- Physics Elective *4 Credits*
- STEM Elective *3 Credits*
- Free Elective *3 Credits*

Spring Semester: 17 Credits

- PH-UY 4124 Thermodynamics and Statistical Physics *4 Credits*
- PH-UY 4904 Senior Project in Physics *4 Credits*

- Physics Elective *3 Credits*
- Physics Elective *3 Credits*
- Free Elective *3 Credits*

Total Credits Required for the Degree: 128

Biomolecular Science, B.S.

Typical Course of Study for the Bachelor of Science in Biomolecular Science

Freshman Year

Fall Semester: 17 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits* [1]
- CM-UY 1014 General Chemistry I *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- BMS-UY 1003 Introduction to Cell and Molecular Biology *3 Credits*
- BMS-UY 1001 Introduction to Cell and Molecular Biology Laboratory *1 Credits*

Spring Semester: 18 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits* [1]
- CM-UY 1024 General Chemistry II *4 Credits*
- BMS-UY 2003 Introduction to Physiology *3 Credits*
- BMS-UY 2001 Introduction to Physiology Laboratory *1 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- BMS-UY 1032 Introduction to Biomolecular Science *2 Credits* [2]

Sophomore Year

Fall Semester: 16 Credits

- CM-UY 2213 Organic Chemistry I *3 Credits*
- CM-UY 2211 Organic Chemistry Laboratory I *1 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- CS-UY 1133 Engineering Problem Solving and Programming *3 Credits* or CS-UY 1113 Problem Solving and Programming I *3 Credits* or CS-UY 1114 Intro to Programming & Problem Solving *4 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]
- Elective *2 Credits* [4]

Spring Semester: 16 Credits

- CM-UY 2223 Organic Chemistry II *3 Credits*
- CM-UY 2221 Organic Chemistry Laboratory II *1 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- CM-UY 2614 Physical Chemistry I *4 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Junior Year

Fall Semester: 16 Credits

- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- BMS-UY 3614 Advanced Molecular Biology *4 Credits*
- CM-UY 3314 Biochemistry I *4 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Spring Semester: 15 Credits

- BMS-UY 3513 Biostatistics *3 Credits*
- BMS-UY 3714 Advanced Cell Biology *4 Credits*
- CM-UY 3323 Biochemistry II *3 Credits*
- CM-UY 4011 Information Sources for the Chemical Sciences *1 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Senior Year

Fall Semester: 14-16 Credits

- BMS-UY 3114 Genetics *4 Credits*
- Elective *3-4 Credits* [4]
- Elective *3-4 Credits* [4]
- BMS-UY 4914 Undergraduate Research in Biomolecular Science *4 Credits* [5]

Spring Semester: 13-16 Credits

- BMS-UY 4924 Undergraduate Research in Biomolecular Science *4 Credits* [5]
- Elective *3-4 Credits* [4]
- Elective *3-4 Credits* [4]
- Elective *3-4 Credits* [4]

Total credits required for graduation: 128

Footnotes

[1] Students placed by examination or an adviser into MA-914 must defer registration for MA-UY 1024; MA-UY 1024/1124 may be replaced with MA-UY 1324/1424.

[2] BMS-UY 1032/CM-UY 1032 cannot be taken by and is not required for transfer students or students changing major after the freshman year.

[3] Choice of Humanities and Social Sciences electives must conform to the Tandon requirements described in the Bulletin. At least one elective must be an ethics course, such as PL-UY 2144. At least one elective must be at the 3xxx/4xxx level. At least one elective must be a writing-intensive course labeled by "W" and must be taken at Tandon. Students may take a maximum of 4 courses or 16 credits at other schools of NYU.

[4] Elective options:

(i) At least 6 credits of technical electives must be selected from the following courses: BMS-UY (level 2, 3, and 4), CM-UY (level 3 and 4), BT-GY, BE-GY and BI-GY (collectively referred to as "Group 1").

(ii) At least 6 credits of technical electives must be selected from the following courses: A Group 1 course (as defined above), MA-UY, CS-UY, PH-UY, CBE-UY or, with advisor's permission a technical elective related to BMS major at another school of NYU (collectively referred to as "Group 2"). Students may take a maximum of 4 courses or 16 credits at other schools of NYU.

(iii) The remaining courses (up to 8 credits) are free electives, for example, a course related to management, finance, or media studies (advisor's permission is required).

[5] Students electing senior research must take both semesters of research and write a BS thesis. Students may replace research and thesis with 8 credits of technical electives from Group 1 or Group 2, but at least one course must be chosen from Group 1.

Required safety trainings: All sophomore BMS and CBE majors must enroll in (on BioRaft) and complete three one-hour training sessions offered by the NYU EHS (Environmental Health and Safety) Office. The three sessions are: Lab Safety, Waste Management and Biosafety. Student must show proof (e.g. certificate) that they completed this training to their advisors at their next advisement meeting in order to have their registration holds removed. Each subsequent fall they must take three online refresher sessions until they graduate.

Residency requirements: To satisfy residency requirements for the BS degree students must complete a minimum of 64 credits at the University in approved coursework. In addition, students must complete their final 32 credits at the University, unless approved for a special term abroad.

NOTE: The department usually does not grant transfer credits to students who, while registered at the NYU Tandon School of Engineering, take biology or chemistry courses at other universities.

Summary of requirements for the BS degree:

Subject / Credits Required

- Chemistry / 28
- Biology / 25
- Research / 8
- Computational / 3
- Engineering and Technology Forum / 1
- Writing / 8
- Humanities and Social Science Electives / 16
- Mathematics / 8
- Physics / 11
- Electives / 20

- **TOTAL / 128**

Business and Technology Management, B.S.

Academic and Administrative Program Director: Bohdan Hoshovsky

Goals and Objectives

The Bachelor of Science in Business and Technology Management (BTM) Program is a STEM program. It is anchored on certain overarching themes, including:

- Achieving prowess through innovation, technology management and entrepreneurship.
- Leading based on a broad understanding of technology's role in the modern enterprise.
- Developing a global perspective of modern value creation.
- Committing oneself to service to the community.
- Adhering to the highest ethical standards.
- Obtaining practical exposure-through internships, speakers, on-site visits in New York City, etc.-to the latest best practices in management, especially as related to technology and innovation management and entrepreneurship.

BTM is oriented toward current and future arenas where high growth occurs. The program assumes that modern business leaders must be deeply familiar with technology and innovation. Those who have such knowledge are likely to have a distinct advantage and prosperous and satisfying careers. When appropriate, these leaders also can leverage entrepreneurship in diverse venues. The BTM Program prepares students to become such leaders.

BTM also provides students with relevant professional management education and effective approaches related to technology, innovation and information management and entrepreneurship. In other words, BTM creatively fuses modern business administration with state-of-the-art technology management.

The BTM Program is STEM based which offers rigorous training in the qualitative, quantitative and innovative aspects of technology and innovation management. All courses nurture a broad managerial background along with specific application of ideas and practices relevant to the world of technologically innovative goods and services.

The art and science of management also demand that practitioners communicate ideas effectively. Therefore, as central components of the BTM learning experience the program emphasizes spoken and written presentations in individual, team, classroom and field internship settings.

Students completing BTM are prepared to succeed in a variety of positions-such as technology project leaders, technology entrepreneurs, venture capitalists, technology and IT analysts for various organizations, consultants in professional-services firms, marketing and business-unit managers for new products and services, and a variety of other exciting roles. BTM graduates work in large and small companies and they excel at jobs that require a cross-functional understanding of both technology and the motivational, financial, innovative and international challenges that need to be met for innovation to succeed. BTM students are also well prepared for advanced professional studies in management, such as in a MS in Management of Technology (MOT), or an MBA program, as well as more scholarly and research oriented programs, such as PhD studies.

Pedagogy

Management courses are taught using a variety of pedagogical methods.
These include:

- Theory-led teaching
- Case-method education
- Project-based and team-based teaching
- Action learning in the field

Experiential-Based Learning

Teaching based on exposition of theory is often relevant to technology management classes. Case-method teaching emphasizes real-world business experiences and challenges students to draw general principles from many examples. Project-based and team based education is experiential; students learn by doing, much as they would in a natural sciences laboratory class. Learning by doing in the field is also encouraged. It is very common in management courses for all pedagogical approaches to be employed.

Course Distribution

The BTM Program requires 127 or 128 credits for graduation. Key characteristics* of this curriculum include:

- 56 credits in management
- 28 credits in courses in humanities and social sciences
- 12 credits in courses in mathematics
- 8 credits in "restricted" electives chosen from math, science, social sciences and humanities
- 7 credits in science
- 4 credits in computer science
- 1 credit in the Engineering and Technology Forum
- 11-12 credits in Free Electives

*Please see the Typical Course of Study for the BS in BTM Program at the end of this section.

This current curriculum accommodates 4-credit courses in humanities and social sciences, as well as a 3-credit course in the sciences and a 3 credit Free Elective.

Course Numbering

BTM courses are numbered with the following schema:

- The first digit of a course number corresponds to the year in which a BTM student would take the course (1 = first year, etc.)
- The second digit reflects the primary nature of the course material. Courses numbered with a second digit of
  "0" are focused primarily on processes in management
  "1" are oriented toward organizational behavior
  "2" are quantitative in nature
  "3" describe a firm's relationships with external forces
  "4" study innovation
  "5" are capstone courses
  "6" are Internship and Service courses
  "9" thesis

Thus, MG-UY 3304 Introduction to Supply Chain Management is a 4-credit junior-year course focusing on external relationships.

Concentrations

Students in this degree program may direct their study in one of two areas of concentration, which focus on particular issues and strategies that apply to business and technology management:

1. **Technology Innovation and Strategy** enables students to develop effective skills for conducting strategic analysis addressing marketing, logistics, channel and operations managements issues, as well as relevant best business practices in the technological arena.
2. **Technology and Innovation in Finance** prepares students to understand financial theory and how firms use modern finance for strategic and tactical decision-making.

Candidates who choose the Technology Innovation and Strategy concentration must complete both MG-UY 3304 (Introduction to Supply Chain Management) in their 6th semester and MG-UY 4004 (Management Strategy in Technology Sectors) in their 7th semester. Students electing the Technology and Innovation in Finance concentration of study must complete both MG-UY 3214 (Advanced Corporate Finance) in their 6th semester and MG-UY 4214 (Financial Strategy) in their 7th semester.

Degree Requirements
To remain in good standing, candidates for the degree BS-BTM must satisfy the following requirements, in addition to NYU Tandon requirements for a minimum term and cumulative 2.0 GPA in all courses:

- An average of C (2.0) or better in all MG courses must be maintained.
- A course in which the grade of I is received may not be used to satisfy any prerequisites until the incomplete is resolved.

Honors Capstone
(Including Thesis and Honor's Thesis)
Students who earn a 3.6 cumulative GPA or better in MG-UY courses through their junior year of study qualify for honors senior project capstone courses when available. These students are also free to not elect this project sequence.

As part of the Honor's Capstone course, students who earn a 3.6 cumulative GPA or better in MG-UY courses through their junior year qualify for an optional MG-UY 4904 BS Thesis in Business and Technology Management and follow the guidelines as outlined in the Academic Policies and Degree Requirements section of this catalog. They are advised to meet with the BTM Program Director before completing their junior year.

Information

Curricula and prerequisite changes, new courses, special sections and other special announcements are posted in the Department of Technology, Management and Innovation office suite and on the program's website at http://engineering.nyu.edu. Students are responsible for keeping informed, tracking their progress and are encouraged to visit the BTM Program Director regularly.

Typical Course of Study for the Bachelor of Science in Business and Technology Management

See Footnotes [14] and [15]

Freshman Year

Fall Semester: 16 Credits

- MA-UY 1324 Integrated Calculus I for Engineers *4 Credits*
  or MA-UY 1024 Calculus I for Engineers *4 credits* [1a]
- EXPOS-UA 1 Writing the Essay *4 Credits* (Humanities and Social Sciences 1) [2]
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- Science Elective (1) *4 Credits* [3]

Spring Semester: 14 Credits

- MA-UY 1424 Integrated Calculus II for Engineers *4 Credits*
  or MA-UY 1124 Calculus II for Engineers *4 Credits*[1b]
- MG-UY 1002 Foundations of Management *2 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits* (Humanities and Social Sciences 2) [2]
- Science Elective (2) *3 Credits* [3]

Sophomore Year

See Footnotes [11]

Fall Semester: 16 Credits

- MG-UY 2204 Financial Accounting *4 Credits*
- MG-UY 2004 Management of Information Technology and Systems *4 Credits*
- MG-UY 2104 Organizational Behavior *4 Credits*
- TCS CAM/STS/SEG Cluster Elective *4 Credits* (Humanities and Social Sciences 3) [8]

Spring Semester: 16 Credits

- MG-UY 2524 Microeconomics *4 Credits* [12]
- MG-UY 2304 Marketing *4 Credits*
- MG-UY 2014 Operations Management *4 Credits*
- MA-UY 2054 Applied Business Data Analysis I *4 Credits* [13]

Junior Year

See Footnotes [11]

Fall Semester: 18 Credits

- MG-UY 3204 Introduction to Finance *4 Credits*
- MG-UY 3024 Management of Data Communications and Networking *4 Credits*
- MG-UY 3002 Project Management *2 Credits*
- STS-UY 2144 Ethics and Technology *4 Credits* (Humanities and Social Sciences 5) [4]
- Free Elective *4 Credits* [7, 9]

Spring Semester: 16 Credits

- MG-UY 3404 Innovation Management *4 Credits*
- MG-UY 3304 Introduction to Supply Chain Management *4 Credits* (Strat. Con.) [10]
  or
- MG-UY 3214 Advanced Corporate Finance *4 Credits* (Fin. Con.) [10]
- Restricted Elective (1) *4 Credits* [5]
- TCS CAM/STS/SEG Cluster Elective *4 Credits* (Humanities and Social Sciences 6) [2]

Senior Year

See Footnotes [11]

Fall Semester: 16 Credits

- MG-UY 4004 Management Strategy in Technology Sectors *4 Credits* (Strat.Con.) [10]
  or
- MG-UY 4214 Financial Strategy *4 Credits* (Fin. Con.) [10]
- MG-UY 4404 Entrepreneurship *4 Credits* [6]
- Restricted Elective (2) *4 Credits* [5]
- BTM Mandatory TCS STS Cluster Elective *4 Credits* [8] (Humanities and Social Sciences 7) [2]

Spring Semester: 15 or 16 Credits

- MG-UY 4504 Global Perspectives on Technology Management: A Capstone Project Course *4 Credits*
- MG-UY 4204 Management Science *4 Credits* [6]
- Free Elective *3 or 4 Credits* [9]
- Free Elective *4 Credits* [9]

Total credits required for graduation: 127 or 128

Footnotes

[1a] Students who are placed through the Tandon Mathematics Placement Exam or by a Tandon-Courant Mathematics Advisor, into MA-UY 914 Pre-Calculus must successfully complete the course before progressing to MA-UY 1324 Integrated Calculus I for Engineers. MA-UY 1054 Calculus I with Pre-Calculus is no longer offered. A more advanced Calculus I Course than indicated by Tandon-Courant placement exam (MA-UY 1024 Calc 1 for Engineers) may be substituted only with written permission by a Tandon-Courant Mathematics Advisor.

[1b] MA-UY 1052 Calculus II with Pre-Calculus and MA-UY 1154 Calculus II with Pre-Calculus are no longer offered and are replaced by a more advanced Calculus II MA-UY 1424 Integrated Calculus II for Engineers course which follows MA-UY 1324 and may be substituted with MA-UY 1124 Calculus II for Engineers only with written permission by a Tandon-Courant Mathematics Advisor.

[2] Follow latest NYU Tandon School of Engineering & Expository Writing and TCS (HuSS - Humanites & Social Sciences) requirements as stated per the NYU Tandon School of Engineering Bulletin. Note CAM/STS/SEG designate clusters of TCS courses, refer to TCS General Education Requirements for all TCS HuSS courses & prefixes. HUSS8 has been converted into a Free Elective.

[3] BTM students are required to complete a minimum of a total of 7 credits of science electives by choosing 2 approved science elective courses from 2 different course areas as follows: course area 1: (CM-UY 1004 or CM-UY 1014), course area 2: (BMS-UY 1003 with or without BMS-UY 1004 (as BMS-UY 1004 is discontinued)) and course area 3: (PH-UY 1013 or PH-UY 1213). Any science course replacement requires approval by the BSBTM Program Director.

[4] (The prior old PL-UY 2144) STS-UY 2144 Ethics and Technology is mandatory for all BTM majors and counts towards HUSS Credits.

[5] Restricted Electives are Tandon pre-approved courses in math, science, Humanities and Social Sciences (HuSS) ONLY. Computer Science courses may not be counted as Restricted Electives.

[6] Students with a 3.6 GPA or better in major at the end of junior year may substitute, when available, MG-UY 4514 Honors Capstone Project in Technology, Innovation and/or Information Management and Entrepreneurship I (4 credits) or the Bachelor's Thesis in Management (4 credits and with permission by the Dept. Chair) for MG-UY 4404 Entrepreneurship. They may also substitute MG-UY 4524 Honors Capstone Project in Technology, Innovation and/or Information Management Or Entrepreneurship II (4 credits) or MG-UY 4904 BS Thesis in Business and Technology Management (4 credits and with permission by the Dept. Chair) in Management for MG-UY 4204 Management Science . The Bachelor's Thesis in Management may take longer than 1 semester to complete and students must follow all thesis guidelines.

[7] The prior 4cr BTM Technical Elective has been converted into a 4cr Free Elective.

[8] The TCS STS Cluster BTM Mandatory Technology Subset can ONLY be fulfilled by any ONE of the following 4cr TCS Cluster 2: Science, Technology and Society (STS) courses listed below (as writing (W) or non writing courses):

- HI-UY 3304 Science and Technology as a Strategic Resource in World War II
- PL-UY 2004 Symbolic Logic
- PL-UY 2134 Philosophy of Science, Technology and Society in China and India
- PL-UY 2204 Philosophy of Technology
- PL-UY 3004 Metalogic
- PL-UY 3204 Philosophy of Technology: The Critique of Heidegger
- PS-UY 2724 Human Factors in Engineering Design (TCS SEG Cluster 3 course)
- PS-UY 3164 Health Psychology
- PS-UY 3724 Psychology of Sustainability
- PS-UY 3754 Psychology of Living in Extreme Environments
- SEG-UY 2124 Public Policy Issues and the Internet: A Global Perspective
- SEG-UY 2184/W Beyond Oil: Fueling Tomorrow's Vehicles
- STS-UY 1004 Science, Technology, and Society
- STS-UY 2004 Science, Technology, and Society
- STS-UY 2224/W Science and Sexuality
- STS-UY 2234 Introduction to the History of Technology
- STS-UY 2244/W Magic, Medicine, and Science
- STS-UY 2264W Addressing Public Policy Issues in the Sciences, Engineering and Medicine
- STS-UY 2294 Quantum Mechanics and Information
- STS-UY 2324 From Heat Engines to Black Holes
- STS-UY 2364 History of Aviation and Aviation Technology
- STS-UY 2374 The Ship
- STS-UY 2444 History and Philosophy of Internet Technology
- STS-UY 2454W Digital Humanities
- STS-UY 2554 Science and Pseudoscience
- STS-UY 2614W Science Fiction for Innovation

- STS-UY 2624/W The Rhetoric of Science
- STS-UY 2634 Psychology of the Internet
- STS-UY 2644 Creativity and Innovation
- STS-UY 2664 Intelligence: Real and Artificial
- STS-UY 3004W Seminar in Science and Technology Studies
- STS-UY 3204/W Science and Difference
- STS-UY 3214 Science & Feminism
- STS-UY 3234 The Phenomenon Of Life
- STS-UY 3244 The History of Light
- STS-UY 3254/W Philosophy of Science
- STS-UY 3264 Physics, Information and Computation
- STS-UY 3284/W Relativity and Spacetime
- STS-UY 3604 Psychology of Internet Security
- STS-UY 3814 Social Psychology of Virtual Worlds
- STS-UY 3904 Special Topic in STS
- URB-UY 2034 Humans in the Urban Environment
- URB-UY 2044 Methods for Studying Urban Environments
- URB-UY 2064 Introduction to Urban Planning
- URB-UY 2234 Natural Environmental Catastrophes and Cities
- URB-UY 3034 Evidence-Based Design
- URB-UY 3214 Cities in Developing Countries
- URB-UY 3234 Planning for Healthy Cities
- URB-UY 3354 Urban Impact Assessment
- URB-UY 3834 Special Topics in Sustainable Urban Environments

Please note that the above TCS electives may also be used as normal (BTM) HuSS electives.

[9] Free Electives must must follow NYU Tandon guidelines.

[10] Students must select, remain in and complete a BTM Concentration. Current BS BTM Concentrations are Technology Innovation and Strategy Concentration (Strat Concen) & Technology and Innovation in Finance Concentration (Fin Concen). Candidates who choose the Technology Innovation and Strategy concentration must complete both MG-UY 3304 (Introduction to Supply Chain Management) and MG-UY 4004 (Management Strategy in Technology Sectors). Students electing the Technology and Innovation in Finance concentration of study must complete both MG-UY 3214 (Advanced Corporate Finance) taken first, and then MG-UY 4214 (Financial Strategy).

[11] Students may participate in an internship experience through CP-UY 2011 and/or CP-UY 2021 or MG-UY 4603, for a maximum of 3 total internship related credits which will only count as a Free Elective.

[12] ECON-UA 2 Economic Principles II (Microeconomics) was replaced by MG-UY 2524 Microeconomics.

[13] With written permission from the NYU Tandon/Courant Dept. of Mathematics, MA-UY 2054 Applied Data Analysis may be substituted with MA-UY 2224 Data Analysis.

[14] Grandfathering rules may apply.

[15] This chart is for all BSBTM students Fall 2019 onward.

Note: THIS CHART IS ALSO USED FOR ADVISEMENT AND BS BTM DEGREE REQUIREMENT AUDIT CHECKLIST. ALL INFORMATION IS SUBJECT TO REVISION.

Chemical and Biomolecular Engineering, B.S.

Undergraduate Program

The undergraduate program in chemical and biomolecular engineering provides a strong foundation in mathematics and the physical, chemical, and biological sciences. The program builds upon these core fundamentals to provide students with a thorough understanding of their applications in chemical engineering practice, emphasizing universality of natural laws and engineering principles whether at the scale of molecular systems or industrial processes. This is accomplished through an integrated set of core engineering courses that include engineering thermodynamics, conservation laws, reaction kinetics and engineering,unit operations theory and practice, process dynamics, fluid mechanics, and heat and mass transport. The curriculum culminates in a capstone design project, and includes a year-long laboratory that introduces students to classical and modern aspects of chemical engineering operations.

The undergraduate program leads to a Bachelor of Science in Chemical and Biomolecular Engineering and is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Program Educational Objectives

The Program Educational Objectives of the undergraduate CBE major are:

- PEO 1: creatively apply their knowledge and skills to a broad range of contemporary pursuits, taking into account industrial, environmental, economic, safety, global, diversity, and ethical considerations
- PEO 2: apply their technical, communication, and problem-solving skills to the pursuit of careers in the chemical, biochemical, energy and related industries or
- PEO 3: pursue advanced study in graduate programs in chemical engineering and related fields, and in professional programs such as medicine, business, and law
- PEO 4: work both independently and collaboratively to manage complex technical projects
- PEO 5: provide innovation, leadership, and inspiration in their chosen field, continually augmenting their understanding and expertise through formal and informal education

Curriculum

Design is essential to chemical and biomolecular engineering and is incorporated throughout the core courses. Earlier courses emphasize fundamental engineering concepts, while later courses increasingly involve design components and more complex design problems.The senior year introduces a year-long process-design sequence, in which students design chemical and biomolecular processes while considering engineering, safety, environmental and economic constraints.

The chemical and biomolecular engineering major enables graduates to select professional careers from a truly broad spectrum of opportunities. Graduates are prepared for employment in the chemical, pharmaceutical, consumer products, microelectronics, energy, environmental, and related industries, or to enter graduate school.

Undergraduate Advising

All entering freshmen are advised through the Academic Advisement Center. Departmental academic advisers advise sophomores, juniors, seniors and transfer students. Students meet with their academic advisers at least once a semester, coincident with registration for the next term. At this meeting, the adviser discusses the student's work and checks progress towards meeting degree requirements. A graduation checklist must be completed for all students prior to graduation, indicating that all academic requirements have been met.

Requirements for the Bachelor of Science

In addition to the NYU Tandon requirement of a 2.0 GPA or better for graduation, students must also meet the department's academic standards. For chemical and biomolecular engineering students to advance to senior-year, they must maintain a minimum average GPA of 2.5 in courses CBE-UY 2124, CBE-UY 3153, CBE-UY 3313, CBE-UY 3233, CBE-UY 3223 and CBE-UY 3323. The same course must not be failed twice. Students who fail to meet these requirements are not allowed to register for senior courses. All listed prerequisites must be satisfied before students may enroll in CBE courses. In addition, students need a grade of B- or better in their first college level mathematics course (typically MA-UY 1024) for registering into the sophomore course CBE-UY 2124. Should the above requirements not be met, students must meet with their faculty advisor to formulate an individual remedial plan. Typically, one or more courses will need to be retaken until the missing requirement is satisfied, possibly leading to a delayed graduation.

Required Safety Trainings: All sophomore CBE majors must enroll in (on BioRaft) and complete three one-hour training sessions offered by the NYU EHS (Environmental Health and Safety) Office. The three sessions are: Lab Safety, Waste Management and Biosafety. Student must show proof (e.g. certificate) that they completed this training to their advisors at their next advisement meeting in order to have their registration holds removed. Each subsequent fall they must take three online refresher sessions until they graduate.

Below is a typical sequence of courses taken for the Bachelor of Science in Chemical and Biomolecular Engineering. Adjustments to this sequence can be made for participation in study abroad programs, for transferring credits from other institutions, or for other considerations based on individual circumstances.

Typical Course of Study for the Bachelor of Science in Chemical and Biomolecular Engineering

Freshman Year

Fall Semester: 16 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits* [1]
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*

Spring Semester: 17 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits*
- BMS-UY 1001 Introduction to Cell and Molecular Biology Laboratory *1 Credits*
- BMS-UY 1003 Introduction to Cell and Molecular Biology *3 Credits*
- CBE-UY 1002 Introduction to Chemical and Biomolecular Engineering *2 Credits* [2]
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- CS-UY 1133 Engineering Problem Solving and Programming *3 Credits*

Sophomore Year

Fall Semester: 14 Credits

- PH-UY 1013 Mechanics *3 Credits*
- CM-UY 2213 Organic Chemistry I *3 Credits*
- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- CBE-UY 2124 Analysis of Chemical and Biomolecular Processes *4 Credits*

Spring Semester: 15 Credits

- CM-UY 2614 Physical Chemistry I *4 Credits*
- CM-UY 2223 Organic Chemistry II *3 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*

Junior Year

Fall Semester: 18 Credits

- CM-UY 3334 Biochemistry for Engineers *4 Credits*
- CBE-UY 3153 Chemical and Biomolecular Engineering Thermodynamics *3 Credits*
- CBE-UY 3313 Transport I *3 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Spring Semester: 16 Credits

- CBE-UY 3233 Chemical and Biomolecular Engineering Separations *3 Credits*
- CBE-UY 3223 Kinetics and Reactor Design *3 Credits*
- CBE-UY 3323 Transport II *3 Credits*
- Engineering Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Senior Year

Fall Semester: 16 Credits

- CBE-UY 4113 Engineering Laboratory I *3 Credits*
- CBE-UY 4143 Process Dynamics and Control *3 Credits*
- CBE-UY 4163 Chemical and Biomolecular Process Design I *3 Credits*
- Free Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Spring Semester: 16 Credits

- CBE-UY 4213 Engineering Laboratory II *3 Credits*
- CBE-UY 4173 Polymeric Materials *3 Credits*

- CBE-UY 4263 Chemical and Biomolecular Process Design II *3 Credits*
- Engineering Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Total credits required for graduation: 128

Footnotes

[1] Students who are placed by examination or by an adviser into MA-UY 914 must defer registration for MA-UY 1024.

[2] Students who do not take CBE-UY 1002 (or another 2 credit introductory engineering course) can replace it with two additional credits of engineering electives.

[3] The requirements for Humanities and Social Sciences electives are described in the Undergraduate Academic Programs and Policies section of this catalog.

Note: TRANSFER STUDENTS may substitute 3 credits of engineering electives in place of EG-UY 1003. In addition, they are not required to complete EG-UY 1001.

Civil Engineering, B.S.

Undergraduate Program

The Department of Civil and Urban Engineering develops engineering graduates capable of contributing to and advancing the practice of civil engineering and its subdisciplines. Through its research programs, the department strives to be at the forefront in selected areas in the development of new knowledge and applications in civil engineering. Through its educational programs, graduates will be well rounded in state-of-the-art techniques and will develop the skills needed in a complex profession. Among these skills are the abilities to communicate effectively and to understand the context of civil engineering projects in a complex society.

Program Educational Objectives

Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve. NYU Tandon School of Engineering's undergraduate program in civil engineering is strongly practice-oriented, heavily emphasizing design. The breadth of the core courses prepares students for entry-level positions in any civil engineering subdiscipline or for graduate study; some graduates eventually may work in other professions. Within three to five years of earning undergraduate degrees, graduates will:

1. Apply scientific principles, interdisciplinary knowledge, critical thinking skills, cutting-edge technology, and a passion for civil engineering to solve complex engineering and societal problems.
2. Demonstrate leadership in professional careers, pursue continuous and lifelong learning, and progress towards professional licensure.
3. Communicate and collaborate effectively with industry professionals, decision-makers, and community stakeholders.
4. Work in an ethical and professional manner towards sustainable and resilient civil and urban infrastructure systems.

5. Successfully perform functions of civil engineering practice, including analysis, design, project management, experimentation, interpretation of data, application of new knowledge, and use of sound engineering judgment to draw conclusions.

Student Outcomes

Student outcomes are those abilities and skills that graduates are expected to have upon graduation with a BS in Civil Engineering degree. For these, the Department has adopted the seven fundamental outcomes specified by the Engineering Accreditation Commission of ABET, http://www.abet.org. They cover the full breadth and depth of the abilities and skills needed by modern engineering professionals. They are listed below with brief discussions of how each relates to the civil engineering profession.

1. **An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.** *Virtually all of civil engineering involves the application of mathematics and basic sciences to the solution of real-world infrastructure problems. Fundamental engineering skills evolve directly from science and mathematics. Students are immersed in these applications across all subdisciplines of civil engineering. The program is frequently updated to incorporate the latest approaches to engineering solutions, and to include the use of modern engineering tools. Important "tools" include a variety of computer programs for data analysis, simulation and design. The program is heavily design-oriented. Several courses include full design-project laboratories. Many additional courses have design components, and all students finish their academic programs with a comprehensive civil engineering capstone project.*

2. **An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.** *Engineers do not just solve problems brought to them by others. Engineers must spot problems before they become evident and describe them in terms that expedite their solution. As students progress through the program, they increase their participation in identifying and framing problems, as well as in developing comprehensive solutions.*

3. **An ability to communicate effectively with a range of audiences.** *Engineers do not solve problems in a vacuum. Everything engineering professionals do affects the world around them. In the modern world economy, the "world" includes local neighborhoods, regions, states, nations and, indeed, the world. Solutions must be couched in a firm understanding of the impacts they will have on the environment, the economy and society.Engineers must explain their views and solutions to problems in ways that can be understood clearly by other professionals and by the public. Modern communication involves written and oral forms, and a wide variety of electronic media.*

4. **An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.** *All professionals must be keenly aware of their general and professional ethical responsibilities to society in general, and to others who require and pay for their services. Like many professions, engineers, and civil engineers in particular, have specific ethical codes issued by professional societies with which they must comply. General ethical considerations are discussed throughout the curriculum, and several courses have a strong focus on the basis for, and application of, professional ethical code.*

5. **An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.** *Any significant project involves several engineers, perhaps with different engineering backgrounds, as well as non-engineers (planners, architects, financiers, managers, etc). Students have the opportunity to work in teams in several courses, but particularly in the capstone design project.*

6. **An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.** *Civil engineers must engage in a number of basic experiments, and be aware of how to collect, organize, report and interpret the results of basic experiments and direct field observations of infrastructure operations. In the program, students are exposed to a wide range of laboratory experiments, including experiments in fluid mechanics, material behavior under loading, soil properties and behavior, and others. They also are exposed to the collection of field data related to environmental conditions and problems, highway and street traffic, and the monitoring of structures.*

7. **An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.** *The engineering profession changes rapidly with the technological world. While general principles tend to change slowly, the specific materials, analysis techniques and approaches to engineering change quite rapidly. The body of knowledge graduates leaves with must be updated constantly and expanded during their professional lives. The program provides opportunities for students to appreciate this need, and develop useful skills for self-learning, now and in the future.*

Curriculum

The undergraduate curriculum for the BS in Civil Engineering provides a solid foundation in all major subdisciplines through required courses. It also requires a concentration in one of five areas (structural engineering, transportation engineering, environmental engineering, urban informatics, or construction management). Table 1 summarizes the curriculum and its requirements in subject-area categories. A typical four-year course of study for civil engineering majors is shown on the full-page chart at the end of this section.

Student have progressive design exposure throughout the curriculum. An introduction to design is provided by EG-UY 1003 in the freshman year. Courses CE-UY 2343, CE-UY 3183, CE-UY 3223, CE-UY 3243, and CE-UY 3153 have subdiscipline-specific design content. Many civil engineering elective courses also have strong design components. All students must complete two capstone design courses (CE-UY 4803 and CE-UY 4813 or CE-UY 4833 or CE-UY 4843 or CE-UY 4853 or CE-UY 4863) during their senior year.

Undergraduate civil engineering elective courses are provided in structural, geotechnical, environmental, water resources and transportation engineering, and construction management and engineering. These allow students to gain significant depth in these areas. Selected students with sufficient gradepoint averages may take graduate courses in these areas. Special topics courses are provided in each major subdiscipline and are offered as needed.

Communication skills are emphasized throughout the curriculum. The humanities and social sciences portions of the curriculum focus strongly on developing writing and oral skills. The freshman engineering program also includes substantial emphasis on oral presentations and written report assignments. All courses with associated laboratories require written laboratory or project reports; many design courses require formal submission of design reports, some with oral presentations. The senior design-project experience includes many oral and written progress reports and is formally presented and defended as part of final submission.

Humanities and social sciences courses also help students to understand the societal context of their profession. CE-UY 1002 and CE-UY 4092 reinforce this understanding with specific civil engineering references and provides a focused treatment of professional ethics. These aspects are also highlighted in other civil-engineering curriculum courses.

Other Requirements

1. After a student completes four semesters or 64 credits at NYU (whichever is earlier), the student must have a combined GPA of at least 2.333 in the following six required CE courses, all of which must be completed by this point: CE-UY 1002 Introduction to Civil Engineering, CE-UY 2133 Engineering Mechanics, CE-UY 2143 Analysis of Determinate Structures, CE-UY 2213 Fluid Mechanics and Hydraulics, CE-UY 2343 Transportation Engineering, and CE-UY 2533 Construction Project Management. If a student has a combined

GPA below 2.000 in the above six classes, the student may not be allowed to remain in the major. If a student has a combined GPA of at least 2.000 and below 2.333, the student may be required to re-take at least one of the courses to raise the GPA to 2.333 before being allowed to enroll in some junior-level required CE courses. If the student has not yet completed all six of the courses, the student will be required to enroll in them that semester.

2. Since the capstone design course, CE-UY 4803 Civil Engineering Capstone requires a thorough understanding of all aspects of civil engineering, students registering for the course must have a cumulative GPA of 2.000 or better in all civil engineering courses taken thus far, excluding civil engineering electives.
3. To promote interest in professional registration, students must register for the Fundamentals of Engineering (FE) exam, which is administered by the National Council of Examiners for Engineering and Surveying (NCEES). In senior year all students are required to register to take the FE Exam and enroll in CE-UY 4990 Fundamentals of Engineering Exam Registration for CUE. In addition, CE-UY 4092 includes a zero-credit recitation that provides preparation for the exam. Students who are not legally eligible to hold a professional engineer's (PE) license are exempt from this requirement, but must still take CE-UY 4092.

Accreditation

The BS in Civil Engineering is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Curriculum

Please see below for the BS in Civil Engineering curriculum.

Table 1: Curriculum for the BS in Civil Engineering

Mathematics: 16 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits* [1]
- MA-UY 1124 Calculus II for Engineers *4 Credits* [1]
- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits* [1]
- MA-UY 2224 Data Analysis *4 Credits* [1]

Sciences: 18 Credits

- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- Science Elective *3 Credits* [2]

General Engineering, Computer Science: 7 Credits

- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*

- CS-UY 1113 Problem Solving and Programming I *3 Credits*

Humanities and Social Science: 24 Credits

- EXPOS-UA 1 Writing the Essay *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- Humanities and Social Sciences Electives *16 Credits* [3]

Civil Engineering: 52 Credits

- CE-UY 1002 Introduction to Civil Engineering *2 Credits*
- CE-UY 2133 Engineering Mechanics *3 Credits*
- CE-UY 2143 Analysis of Determinate Structures *3 Credits*
- CE-UY 2213 Fluid Mechanics and Hydraulics *3 Credits*
- CE-UY 2343 Transportation Engineering *3 Credits*
- CE-UY 2533 Construction Project Management *3 Credits*
- CE-UY 3013 Computing in Civil Engineering *3 Credits*
- CE-UY 3153 Geotechnical Engineering *3 Credits*
- CE-UY 3163 Materials for the Built Environment *3 Credits*
- CE-UY 3183 Structural Engineering *3 Credits*
- CE-UY 3223 Introduction to Environmental Engineering *3 Credits*
- CE-UY 3243 Water Resources Engineering *3 Credits*
- CE-UY 4092 Leadership, Business Principles, Policy and Ethics in Civil Engineering *2 Credits*
- CE-UY 4803 Civil Engineering Capstone *3 Credits*
- CE-UY 48X3 Civil Engineering Concentration Capstone *3 Credits* [4]
- CE-UY 4990 Fundamentals of Engineering Exam Registration for CUE *0 Credits*
- Civil Engineering Electives *9 Credits*

Free Elective: 12 Credits

- Free Elective *12 Credits* [5]

Total Credits for Degree: 129

Footnotes for Table 1

[1] Placement in math classes is based on AP credit and/or placement exams administered by the Mathematics Department.

[2] Students may select a basic science elective from one of the following courses: Introduction to Cell and Molecular Biology, Astronomy and Astrophysics, or Introduction to Geophysics (Geology)

[3] Students must take sixteen credits (four courses) of elective courses in the humanities and social sciences. Consult the Technology, Culture and Society portion of the bulletin for details. At least one humanities and social sciences elective must be a 3xxx/4xxx level course. At least one humanities and social sciences elective must be a writing-intensive course, labeled by "W."

[4] A capstone design course associated with an area of concentration (structural engineering, transportation engineering, environmental engineering, urban informatics, or construction management) is required.

[5] A free elective is any course in any department of the University for which the student has the prerequisites.

Typical Course of Study for the Bachelor of Science in Civil Engineering

Please see below for the Typical Course of Study.

Freshman Year

Fall Semester: 16 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*

Spring Semester: 16 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- CS-UY 1113 Problem Solving and Programming I *3 Credits*
- CE-UY 1002 Introduction to Civil Engineering *2 Credits*

Sophomore Year

Fall Semester: 18 Credits

- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- Humanities and Social Sciences Elective #1 *4 Credits*
- CE-UY 2133 Engineering Mechanics *3 Credits*
- CE-UY 2533 Construction Project Management *3 Credits*

Spring Semester: 17 Credits

- MA-UY 2224 Data Analysis *4 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- CE-UY 2143 Analysis of Determinate Structures *3 Credits*
- CE-UY 2213 Fluid Mechanics and Hydraulics *3 Credits*

- CE-UY 2343 Transportation Engineering *3 Credits*

Junior Year

Fall Semester: 16 Credits

- Humanities and Social Sciences Elective #2 *4 Credits*
- CE-UY 3223 Introduction to Environmental Engineering *3 Credits*
- CE-UY 3183 Structural Engineering *3 Credits*
- CE-UY 3243 Water Resources Engineering *3 Credits*
- CE-UY 3013 Computing in Civil Engineering *3 Credits*

Spring Semester: 15 Credits

- Science Elective *3 Credits*
- CE-UY 3153 Geotechnical Engineering *3 Credits*
- CE-UY 3163 Materials for the Built Environment *3 Credits*
- Civil Engineering Elective #1 *3 Credits*
- Free Elective #1 *3 Credits*

Senior Year

Fall Semester: 15 Credits

- Humanities and Social Sciences Elective #3 *4 Credits*
- Civil Engineering Elective #2 *3 Credits*
- Free Elective #2 *3 Credits*
- CE-UY 4092 Leadership, Business Principles, Policy and Ethics in Civil Engineering *2 Credits*
- CE-UY 4803 Civil Engineering Capstone *3 Credits*

Spring Semester: 16 Credits

- CE-UY 48x3 Civil Engineering Concentration Capstone *3 Credits*
- Civil Engineering Elective #3 *3 Credits*
- Free Elective #3 *3 Credits*
- Free Elective #4 *3 Credits*
- Humanities and Social Sciences Elective #4 *4 Credits*

Total credits required for graduation: 129

Computer Engineering, B.S.

Typical Course of Study for the Bachelor of Science in Computer Engineering

Freshman Year

Fall Semester: 16 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits* [2]
- EG-UY 1003 Introduction to Engineering and Design *3 Credits* [1]
- EG-UY 1001 Engineering and Technology Forum *1 Credits* [1]
- EXPOS-UA 1 Writing the Essay *4 Credits*

Spring Semester: 17 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- CS-UY 1134 Data Structures and Algorithms *4 Credits* [2]
- ECE-UY 1012 Introduction to Computer Engineering *2 Credits* [1]
  OR
- ECE-UY 1002 Introduction to Electrical and Computer Engineering *2 Credits* [1]
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Sophomore Year

Fall Semester: 16 Credits

- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- CS-UY 2124 Object Oriented Programming *4 Credits* [2]
- ECE-UY 2004 Fundamentals of Electric Circuits *4 Credits*

Spring Semester: 15/16 Credits

- MA-UY 2314 Discrete Mathematics *4 Credits*
- Math/Science Elective *3-4 Credits*
- CS-UY 2204 Digital Logic and State Machine Design *4 Credits* [2]
- ECE-UY 3114 Fundamentals of Electronics I *4 Credits*

Junior Year

Fall Semester: 15/17 Credits

- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- Math/Science Elective *3-4 Credits*
- CS-UY 2214 Computer Architecture and Organization *4 Credits*
- ECE/CS Elective *3-4 Credits*

- ECE-UY 4001 ECE Professional Development and Presentation *1 Credits*

Spring Semester: 14/16 Credits

- MA-UY 2224 Data Analysis *4 Credits*
- ECE-UY 4144 Introduction to Embedded Systems Design *4 Credits*
- Humanities and Social Sciences Elective Course *4 Credits* [3]
- Free Elective *3-4 Credits*

Senior Year

Fall Semester: 17/18 Credits

- ECE/CS 4XX3 Design Project *3 Credits*
- ECE/CS Elective
- Humanities and Social Sciences Elective Course *4 Credits* [3]
- Free Elective *3 Credits*
- Free Elective *3-4 Credits*

Spring Semester: 16/18 Credits

- ECE/CS 4XX3 Design Project II *3 Credits*
- Humanities and Social Sciences Elective Course *4 Credits* [3]
- Humanities and Social Sciences Elective Course *4 Credits* [3]
- Free Elective *3-4 Credits*
- Free Elective *3 Credits*

Total credits required for graduation: 128

Notes

Note: A GPA (Technical) of at least 2.0 is required in all ECE and CS courses.

[1] For transfer students and students changing major, ECE-UY 1002 Introduction to Electrical and Computer Engineering or ECE-UY 1012 Introduction to Computer Engineering is not required. EG-UY 1001 Engineering and Technology Forum and EG-UY 1003 Introduction to Engineering and Design may also be excused depending upon transfer credits.

[2] Grades of at least C- are required in CS-UY 1114, CS-UY 1134, CS-UY 2124, CS-UY 2204, and ECE-UY 2004. C if repeated twice.

[3] Choice of humanities and social sciences electives must conform to the established requirements of the Technology, Culture and Society Department. After the first-year writing courses, students will need *one writing intensive elective course (W)*. In addition, one of the four courses **must be a Junior or Senior-level course.**

Computer Science, B.S.

Undergraduate Program

Computer science focuses on how to design, build, and effectively use the computers and systems that we interact with every day from the smart phones in our hands to the complex databases in our banks and hospitals. Because computer technology powers the most essential functions of business, industry, government and entertainment, computer scientists have tremendous opportunities for growth and exploration.

In addition to the BS degree in Computer Science, the Computer Science and Engineering department offers minors in Computer Science, Cybersecurity, and Game Engineering. The NYU Tandon School of Engineering also offers a BS/MS Program that enables students to earn both a BS and an MS degree at the same time. For instance, a student can receive a BS in Computer Science and MS in Computer Science, a BS in Computer Engineering and MS in Computer Science, or a BS in Electrical Engineering and MS in Computer Science. Depending on the student's preparation and objectives, they can complete both degrees within 5 years. More information on the BS/MS program can be found on the "Undergraduate Academic Requirements and Policies" section of the catalog.

The program provides research labs for specialized study in areas such as cybersecurity, game engineering, and big data, areas in which our department has a distinctive strength. In addition, the program's close ties to our graduate division immerse students in a vibrant, intellectual atmosphere.

Goals and Objectives

With the BS program in Computer Science, the department aims to:

- Provide a deep understanding of fundamental computer science subjects;
- Provide avenues of specialization, such as digital games, cybersecurity, and computer systems;
- Achieve a proper balance between theoretical study and practical design in order to solve problems effectively;
- Supplement technical skills with courses in humanities, social science, and business; and
- Provide opportunities for excellent students to pursue independent study, as well as directed research, with faculty members who are internationally recognized in their fields.

Curriculum Overview

Below is an overview of the Computer Science BS curriculum. A typical course schedule is located at the end of this section.

Computer Science Introductory Sequence

- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- CS-UY 1134 Data Structures and Algorithms *4 Credits*
- CS-UY 2124 Object Oriented Programming *4 Credits*

Other Required Computer Science Courses

- CS-UY 1122 Introduction to Computer Science *2 Credits*
- CS-UY 2214 Computer Architecture and Organization *4 Credits*
- CS-UY 3224 Operating Systems *4 Credits*
- CS-UY 2413 Design and Analysis of Algorithms *3 Credits*

- CS-UY 4513 Software Engineering *3 Credits*
- CS-UY 4523 Design Project *3 Credits*

Required Mathematics Courses

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*
- MA-UY 2314 Discrete Mathematics *4 Credits*
- MA-UY 2224 Data Analysis *4 Credits*
  Note: *MA-UY 914 Precalculus for Engineers does not count toward the Math requirement.*
  Note: MA 2034 Linear Algebra and Differential Equations or another linear algebra course is recommended, but not required. Some CS electives have knowledge of linear algebra as a prerequisite. Students planning to take such electives should plan accordingly.

Required Engineering Courses

- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*

Science Requirement

Students may choose any three natural science courses (each at least 3 credits) offered by the NYU Tandon School of Engineering, provided that they meet pre-requisites and co-requisites:

- BMS-UY 1004 Introduction to Cell and Molecular Biology *4 Credits*
- BMS-UY 2004 Introduction to Physiology *4 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- CM-UY 1014 General Chemistry I *4 Credits*
- CM-UY 1024 General Chemistry II *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits* and PH-UY 2121 General Physics Laboratory I *1 Credit*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits* and PH-UY 2131 General Physics Laboratory II *(1 Credit)*

Humanities and Social Sciences Requirement

Students are required to take six courses in humanities and social sciences. Two of these courses are specified below; the remaining four courses are electives, one of which must be a writing-intensive course (denoted by a "W" in the course number) and one must be an ethics course.

- EXPOS-UA 1 Writing the Essay *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- Any Ethics course *4 credits*

Electives

- 18 additional credits in computer science electives [4]

- 26 credits of free electives [4]

<u>Note</u>**:** *NYU SPS courses are not accepted as free electives.*

Typical Course of Study for the Bachelor of Science in Computer Science

Freshman Year

Fall Semester: 16 Credits

- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits* [1]
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits* [2]
- MA-UY 1024 Calculus I for Engineers *4 Credits* [3]
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*

Spring Semester: 17 Credits

- CS-UY 1134 Data Structures and Algorithms *4 Credits* [1]
- CS-UY 1122 Introduction to Computer Science *2 Credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- Science Elective *3 Credits* [3]

Sophomore Year

Fall Semester: 15 Credits

- CS-UY 2124 Object Oriented Programming *4 Credits* [1]
- MA-UY 2314 Discrete Mathematics *4 Credits*
- Science Elective *3 Credits* [4]
- Humanities and Social Sciences Elective *4 Credits* [5]

Spring Semester: 15 Credits

- CS-UY 2214 Computer Architecture and Organization *4 Credits*
- CS-UY 2413 Design and Analysis of Algorithms *3 Credits*
- MA-UY 2224 Data Analysis *4 Credits* [7]
- Humanities and Social Sciences Elective *4 Credits* [5]

Junior Year

Fall Semester: 17 Credits

- CS-UY 3224 Operating Systems *4 Credits*

- CS Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits* [5]
- Science Elective *3 Credits* [4]
- Free Elective *3 Credits*

Spring Semester: 16 Credits

- CS Elective *3 Credits*
- CS Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits* [5]
- Free Elective *3 Credits*
- Free Elective *3 Credits*

Senior Year

Fall Semester: 16 Credits

- CS-UY 4513 Software Engineering *3 Credits*
- CS Elective *3 Credits*
- CS Elective *3 Credits*
- Free Elective *3 Credits*
- Free Elective *4 Credits*

Spring Semester: 16 Credits

- CS-UY 4523 Design Project *3 Credits*
- CS Elective *3 Credits*
- Free Elective *4 Credits*
- Free Elective *3 Credits*
- Free Elective *3 Credits*

Total credits required for graduation: 128

Footnotes

[1] Grade of C- or better is required in CS-UY 1114, CS-UY 1134, and CS-UY 2124. Students who take CS-UY 1113 and CS-UY 1123 may count four credits toward the CS requirements of the major, in lieu of CS-UY 1114. The other two credits will be counted as free electives.

[2] Students who are placed by examination or by an adviser into MA-UY 914 must defer registration for MA 1024.

[3] The Science electives may be chosen from any of the following natural sciences (Physics, Biology, and Chemistry). Many science courses are 4 credits or require co-requisite lab.

[4] With approval of the CSE department, certain closely related courses in EE, Math or other related disciplines may be substituted for CS electives. A list of approved substitutions is available in the CSE department.

[5] At least one Humanities and Social Sciences elective must be a Writing-intensive course. Writing-intensive Humanities and Social Sciences courses are designated by "W." In addition, one Humanities and Social Sciences elective must be a 3XXX or 4XXX level. Approved Humanities and Social Sciences electives span three clusters: CAM, STS and SEG. Students are encouraged to take Humanities and Social Sciences electives across clusters and/or disciplines within a cluster.

Construction Management, B.S.

Undergraduate Program

The Bachelor of Science in Construction Management is an interdisciplinary program in the Department of Civil and Urban Engineering. The program prepares students for a challenging career in the construction industry-as future leaders in a dynamic and ever-changing environment. It concentrates on the skills and understanding necessary to excel as a construction management professional and to compete in the marketplace. Graduates are engaged by owners, developers, construction managers, contractors, architects and engineers, lenders and other construction industry participants.

The Bachelor of Science in Construction Management program covers a broad range of subjects in engineering and construction management, such as planning, cost estimating, scheduling, project management and construction administration. The program also exposes students to the latest applications in construction research and technology. The program teaches students the fundamentals of engineering and construction science, as well as business aspects of construction and the application of traditional and emerging construction methods and technologies. Students also study basic economics, accounting and management principles.

Courses and projects in the program's junior and senior years illustrate current project management principles and methods by using materials from, and site visits to, construction projects led by experienced mentors.

Beyond the classroom, real-world work experience is available through internships and summer and part-time employment and through professional organizations and associated student chapters, including the Construction Management Association of America (CMAA), the Associated Schools of Construction (ASC), the American Society of Civil Engineers (ASCE), the Society of American Military Engineers (SAME) and the New York Building Congress (NYBC). NYU's Career Management Center also supports these efforts.

Goals and Objectives

The objective of the Bachelor of Science in Construction Management is to provide the following for its students:
• A solid foundation of knowledge in mathematics and the basic sciences as applied to construction management.
• The knowledge and skills to excel at an entry-level position as a construction professional and/or continue graduate study in construction management or a related field.
• The necessary written and oral communications skills to enable graduates to pursue leadership opportunities.
• A thorough understanding of state-of-the-art techniques and tools in construction management involving three-dimensional computer modeling, building information modeling (BIM), integration of information technology and the application of innovative planning, design and construction administration methodologies.
• A broad education in preparation for lifelong learning and individual growth. Students are required to take courses in writing and the humanities. Electives allow students to further customize their education to enhance individual interests.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviors that students acquire as they progress through the program. The Department has adopted the seven (7) fundamental outcomes specified by ABET, as they cover the full breadth and depth of the abilities and skills needed:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Curriculum

The Bachelor of Science in Construction Management program is advised by a Department Industry Advisory Board, comprising leaders from the engineering and construction professions to help assess and update the program curriculum. The general requirements of the curriculum accommodate the continually expanding requirements of the profession, advancements in knowledge and the contributions of related disciplines.

Table 1 summarizes the Construction Management curriculum by subject category. A typical four-year schedule for the program is included at the end of this section of the bulletin.

Table 1: Curriculum for the BS in Construction Management

Required Courses in Mathematics & Science: 22 Credits

- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- CS-UY 1133 Engineering Problem Solving and Programming *3 Credits*
- MA-UY 1024 Calculus I for Engineers *4 Credits* [1]
- MA-UY 1124 Calculus II for Engineers *4 Credits*
- MA-UY 2054 Applied Business Data Analysis I *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*

Required Courses in Humanities and Social Sciences: 24 Credits

- EXPOS-UA 1 Writing the Essay *4 Credits* [2]
- EXPOS-UA 2 The Advanced College Essay *4 Credits* [2]
- Humanities/Social Sciences Electives *16 Credits* [3]

Required Courses in Management, Economics, Finance or related coursework: 14 Credits

See Footnote [4]

- MG-UY 2204 Financial Accounting *4 Credits*
  or
  FIN-UY 2103 Creating and Understanding Financial Statements *3 Credits*
- FIN-UY 2003 Economic Foundations of Finance *3 Credits*
  or
  any Economics elective
- MG/EC/FIN Level 3xxx or 4xxx Elective *Various Credits*
- MG/EC/FIN Level 3xxx or 4xxx Elective *Various Credits*

Required Courses in Engineering and Construction Management: 52 Credits

- EG-UY 1003 Introduction to Engineering and Design *3 Credits*
- CE-UY 2133 Engineering Mechanics *3 Credits*
- CE-UY 2123 Mechanics of Materials *3 Credits*
- CE-UY 2513 Construction Materials and Methods *3 Credits*
- CE-UY 2523 Contracts and Construction Documents *3 Credits*
- CE-UY 3161 Materials Engineering Laboratory *1 Credits*
- CE-UY 3503 Cost Estimating *3 Credits*
- CE-UY 3513 Construction Scheduling *3 Credits*
- CE-UY 3533 Construction Site Layout and Surveying *3 Credits*
- CE-UY 3553 Non-Structural Building Systems *3 Credits*
- CE-UY 3563 Construction Modeling and Data Structures II *3 Credits*
- CE-UY 4503 Construction Engineering *3 Credits*
- CE-UY 4513 Construction Project Administration *3 Credits*
- CE-UY 4523 Structural Building Systems *3 Credits*
- CE-UY 4533 Construction Law *3 Credits*
- CE-UY 4853 Construction Management Capstone *3 Credits*

Total Credits for Degree: 128 Credits

Footnotes for Table 1

[1] Students may substitute MA-UY 1324, which includes two additional contact hours, for MA-UY 1024.

[2] All students take a writing placement examination. Students for whom English is a second language may be placed in an ESL section, which includes additional hours of language education. Students also may be placed in a remedial section, based upon the exam results, which may or may not carry degree credit.

[3] Student must complete 16 additional credits in Humanities and Social Sciences. At least one elective shall contain at least one credit of ethics. At least one elective must be a 3xxx/4xxx level course. At least one elective must be a writing-intensive course, labeled by "W."

[4] As courses in this category vary among two, three and four credits, the remaining credits can be satisfied by any electives in this category.

Typical Course of Study for the Bachelor of Science in Construction Management

Freshman Year

Fall Semester: 15 Credits

- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- MA-UY 1024 Calculus I for Engineers *4 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*

Spring Semester: 16 Credits

- PH-UY 1013 Mechanics *3 Credits*
- CS-UY 1133 Engineering Problem Solving and Programming *3 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*

Sophomore Year

Fall Semester: 17/18 Credits

- CE-UY 2133 Engineering Mechanics *3 Credits*
- CE-UY 2513 Construction Materials and Methods *3 Credits*
- MG-UY 2204 Financial Accounting *4 Credits*
  or
  FIN-UY 2103 Creating and Understanding Financial Statements *3 Credits*
- Humanities and Social Science Elective *4 Credits*

Spring Semester: 17/18 Credits

- CE-UY 2123 Mechanics of Materials *3 Credits*
- CE-UY 2523 Contracts and Construction Documents *3 Credits*
- FIN-UY 2003 Economic Foundations of Finance *3 Credits*
  or
  Any Economics Elective (ECON xxxx) *4 Credits*
- MA-UY 2054 Applied Business Data Analysis I *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Junior Year

Fall Semester: 17 Credits

- CE-UY 3503 Cost Estimating *3 Credits*
- CE-UY 3513 Construction Scheduling *3 Credits*
- CE-UY 3533 Construction Site Layout and Surveying *3 Credits*
- Liberal Arts & Sciences Elective *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Spring Semester: 14/15 Credits

- CE-UY 3553 Non-Structural Building Systems *3 Credits*
- CE-UY 3563 Construction Modeling and Data Structures II *3 Credits*
- CE-UY 3161 Materials Engineering Laboratory *1 Credits*
- Liberal Arts and Sciences Elective *4 Credits*
- MG/EC/FIN Elective *3 or 4 Credits*

Senior Year

Fall Semester: 16 Credits

- CE-UY 4513 Construction Project Administration *3 Credits*
- CE-UY 4523 Structural Building Systems *3 Credits*
- MG/EC/FIN Elective (3xxx or 4xxx) *2,3, or 4 Credits*
- Liberal Arts & Sciences Elective *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Spring Semester: 16/17 Credits

- CE-UY 4503 Construction Engineering *3 Credits*
- CE-UY 4533 Construction Law *3 Credits*
- CE-UY 4853 Construction Management Capstone *3 Credits*
- MG/EC/FIN Elective (3xxx/4xxx) *3 or 4 Credits*
- Liberal Arts and Sciences Elective *4 Credits*

Total credits required for the degree: 128

Electrical Engineering and Computer Engineering (dual major), B.S.

With departmental permission, students may earn a single bachelor's degree in electrical and computer engineering. This degree requires a total of minimum 141 credits rather than the usual 128 required for individual bachelor's degrees.

Note: A GPA (technical) of at least 2.0 is required in all ECE-UY, CS-UY and ECE-GY courses.

Please note that the curriculum that follows applies to students who began classes in the Fall of 2016 or later. For students who entered the NYU Tandon School of Engineering prior to that date, please review the curriculum and typical course schedule for students entering prior to Fall 2016.

Typical Course of Study for the Bachelors of Science in Electrical Engineering and Computer Engineering (dual major)

First Year

Fall Semester: 16 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits* [1]
- EG-UY 1001 Engineering and Technology Forum *1 Credits* [1]
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits* [2]
- EXPOS-UA 1 Writing the Essay *4 Credits*

Spring Semester: 17 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- ECE/CS 1012 Introduction to Computer Engineering *2 Credits* OR ECE-UY 1002 Introduction to Electrical and Computer Engineering *2 Credits* [1]
- CS-UY 1134 Data Structures and Algorithms *4 Credits* [2]
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Second Year

Fall Semester: 20 Credits

- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- CS-UY 2124 Object Oriented Programming *4 Credits* [2]
- ECE-UY 2004 Fundamentals of Electric Circuits *4 Credits* [2]
- Humanities and Social Sciences Elective *4 Credits* [3]

Spring Semester: 20 Credits

- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- MA-UY 2314 Discrete Mathematics *4 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- CS-UY 2204 Digital Logic and State Machine Design *4 Credits* [2]
- ECE-UY 3114 Fundamentals of Electronics I *4 Credits*

Third Year

Fall Semester: 17/18 Credits

- MA-UY 3113 Advanced Linear Algebra and Complex Variables *3 Credits*
- ECE-UY 2233 Introduction to Probability *3 Credits* OR MA-UY 2233 Introduction to Probability *3 Credits*
- CS-UY 2214 Computer Architecture and Organization *4 Credits*
- ECE-UY 3054 Signals and Systems *4 Credits* [2]

- ECE Elective *3 Credits*

Spring Semester: 18/20 Credits

- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- ECE-UY 3604 Electromagnetic Waves *4 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]
- ECE/CS Restricted Elective *3/4 Credits* [4]
- ECE/CS Restricted Elective *3/4 Credits* [4]

Fourth Year

Fall Semester: 17/19 Credits

- ECE-UY 4001 ECE Professional Development and Presentation *1 Credits*
- ECE/CS 4XX3 Design Project I *3 Credits*
- ECE/CS Restricted Elective *3/4 Credits* [4]
- ECE/CS Restricted Elective *3/4 Credits* [4]
- Free Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits* [3]

Spring Semester: 16/17 Credits

- ECE/CS 4XX3 Design Project II *3 Credits*
- ECE/CS Elective *3 Credits*
- ECE/CS Elective *3 Credits*
- ECE/CS Restricted Elective *3/4 Credits* [4]
- Humanities and Social Sciences Elective *4 Credits* [3]

Total Credits Required for the Degree: 141

Notes

1. For transfer students and students changing their major, "Introduction to Computer Engineering" is not required. EG-UY 1001 Engineering and Technology Forum and EG-UY 1003 Introduction to Engineering and Design may also be excused depending on transfer credits.

2. Grades of at least C- are required in CS-UY 1114, CS-UY 1134, CS-UY 2124, CS-UY 2204, ECE-UY 2004 and ECE-UY 3054. C if repeated twice.

3. Choice of a HuSS electives must conform to the established requirements of the Technology. Culture and Society Department. After the first-year writing sequence, students will need **one writing intensive course (W)**. In addition, one of the four courses must be a *Junior or Senior level course*.

4. An ECE/CS restricted elective is any course that a student has the pre-requisites for and is on the list of ECE/CS Restricted Electives announced by the Computer Science and Engineering and Electrical and Computer Engineering Departments or on the list of ECE Restricted Electives announced by the Electrical and Computer Engineering Department.

- Students must choose at least two (2) courses from the ECE Restricted Electives list.
- Among the remaining three, students must one (1) CS course, one (1) EE course, and one from CS or ECE from the set of CS Restricted Electives and ECE Restricted Electives both of which are updated by the two departments.

Electrical Engineering, B.S.

Typical Course of Study for the Bachelor of Science in Electrical Engineering

Freshman Year

Fall Semester: 16 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits* [5]
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*

Spring Semester: 16/17 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- Math/Science Elective *3-4 Credits*
- ECE-UY 1002 Introduction to Electrical and Computer Engineering *2 Credits* [1]
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Sophomore Year

Fall Semester: 16 Credits

- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- ECE-UY 2004 Fundamentals of Electric Circuits *4 Credits* [4]
- CS-UY 2204 Digital Logic and State Machine Design *4 Credits* [4]

Spring Semester: 14/16 Credits

- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- Math/Science Elective *3-4 Credits*
- ECE-UY 3114 Fundamentals of Electronics I *4 Credits*
- CS-UY 1134 Data Structures and Algorithms *4 Credits*
  OR

- CS-UY 2163 Introduction to Programming in C *3 Credits*

Junior Year

Fall Semester: 17/18 Credits

- MA-UY 3113 Advanced Linear Algebra and Complex Variables *3 Credits*
- ECE-UY 2233 Introduction to Probability *3 Credits*
- ECE-UY 3054 Signals and Systems *4 Credits* [4]
- Free Elective *3-4 Credits*
- Humanities and Social Sciences Course *4 Credits* [2]

Spring Semester: 15/16 Credits

- ECE-UY 3604 Electromagnetic Waves *4 Credits*
- ECE Restricted Elective *4 Credits* [3]
- Free Elective *3-4 Credits*
- Humanities and Social Sciences Course *4 Credits* [2]

Senior Year

Fall Semester: 15/16 Credits

- ECE 4XX3 Design Project I *3 Credits* **OR** VIP-UY Course *3 Credits*
- ECE-UY 4001 ECE Professional Development and Presentation *1 Credits*
- ECE Restricted Elective *4 Credits* [3]
- Free Elective *3-4 Credits*
- Humanities and Social Sciences Course *4 Credits* [2]

Spring Semester: 16/18 Credits

- ECE 4XX3 Design Project II *3 Credits*
- ECE Elective *3-4 Credits*
- Free Elective *3-4 Credits*
- Free Elective *3 Credits*
- Humanities and Social Sciences Course *4 Credits* [2]

Total credits required for the degree: 128

Notes

[1] For transfer students and students changing major, ECE-UY 1002 is not required.

[2] Choice of Humanities and Social Sciences courses must conform to university requirements.

[3] The Restricted Electives must be 2 of 5 courses:

- ECE-UY 3124 Fundamentals of Electronics II
- ECE-UY 3824 Electric Energy Conversion Systems
- ECE-UY 3404 Fundamentals of Communication Theory
- ECE-UY 3064 Feedback Control
- ECE-UY 4144 Introduction to Embedded Systems Design

[4] A grade of at least C- is required in CS-UY 1114 or CS-UY 1133, CS-UY 2204, ECE-UY 2004, and ECE-UY 3054.

[5] CS-UY 1114 is strongly recommended, but CS-UY 1133 is also acceptable (for students changing major to EE, etc.).

Integrated Digital Media, B.S.

Bachelor of Science Degree Requirements

Digital Media Core: 42 Credits

- DM-UY 1113 Audio Foundation Studio *3 Credits*
- DM-UY 1123 Visual Foundation Studio *3 Credits*
- DM-UY 1133 Creative Coding *3 Credits*
- DM-UY 1143 Ideation & Prototyping *3 Credits*
- DM-UY 2193 Intro to Web Development *3 Credits*
- DM-UY 2263 Still and Moving Images *3 Credits*
- DM-UY 4003 Senior Project in Digital Media *3 Credits*
- DM-UY 4173 Professional Practices for Creatives *3 Credits*
- DM-UY 2/3/4XXX DM Studio Electives *18 Credits*
  or
- DM-UY 2/3/4XXX DM Studio Electives 15 credits and DM-UY 4034 Internship 4 credits

Math, Science, Humanities, and Social Sciences: 60 Credits

- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- Humanities/Math/Natural Science Electives *25 Credits*
- MA-UY 2414 Basic Practice of Statistics *4 Credits* (or equivalent) **or** MA-UY 1024 Calculus I for Engineers (or equivalent)
- MCC-UE 0001 Introduction to Media Studies *4 Credits* **or** MCC-UE 0003 History of Media and Communication *4 Credits*
- MD-UY 2314 Interactive Narrative *4 Credits*
- PH-UY 1213 Motion and Sound *3 Credits*
- PH-UY 1223 Electricity and Light *3 Credits*
  Select one course from either of the following fields of studies with the EXCEPTION of MCC-UE 1029 New Media Research Studio; MCC-UE 1031 Digital Media Theory and Practice; MCC-UE 1585 Creative Coding.
- Technology and Society
- Interaction and Social Processes
  4 Credits

Free Electives: 18 Credits

Total: 120 Credits

Typical Course of Study for the Bachelor of Science in Integrated Digital Media (POSSIBLE OUTLINE)

Freshman Year

Fall Semester: 14 Credits

- DM-UY 1123 Visual Foundation Studio *3 Credits*
- DM-UY 1133 Creative Coding *3 Credits*
- DM-UY 1143 Ideation & Prototyping *3 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*

Spring Semester: 16 Credits

- DM-UY 1113 Audio Foundation Studio *3 Credits*
- DM-UY 2193 Intro to Web Development *3 Credits*
- DM-UY 2263 Still and Moving Images *3 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- PH-UY 1213 Motion and Sound *3 Credits*

Sophomore Year

Fall Semester: 18 Credits

- PH-UY 1223 Electricity and Light *3 Credits*
- Math, Science, Humanities Elective *4 Credit*s
- Math, Science, Humanities Elective *4 Credit*s
- DM 2/3/4xxx DM Studio Elective 3 *Credits*
- MCC-UE 0001 Introduction to Media Studies *4 Credits* **or** MCC-UE 0003 History of Media and Communication *4 Credits*

Spring Semester: 18 Credits

- DM 2/3/4xxx DM Studio Elective *3 Credits*
- DM 2/3/4xxx DM Studio Elective *3 Credits*
- MD-UY 2314 Interactive Narrative *4 Credits*
- MA-UY 2414 Basic Practice of Statistics *4 Credits* (or equivalent) **or** MA-UY 1024 Calculus I for Engineers (or equivalent)
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*

Junior Year

Fall Semester: 14 Credits

- DM 2/3/4xxx DM Studio Electives *3 Credits*
- Math, Science, Humanities Elective *3 Credits*
- Math, Science, Humanities Elective *4 Credits*
- Free Elective *4 Credits*

Spring Semester: 15 Credits

- DM 2/3/4xxx DM Studio Electives *3 Credits* **or** DM-UY 4033 Internship *3 Credits*
- Math, Science, Humanities Elective *4 Credits*
- Free Elective *4 Credits*
- Select one course from either of the following fields of studies with the EXCEPTION of MCC-UE 1029 New Media Research Studio; MCC-UE 1031 Digital Media Theory and Practice; MCC-UE 1585 Creative Coding. *4 Credits*
    1. Technology and Society
    2. Interaction and Social Processes

*http://steinhardt.nyu.edu/mcc/undergraduate/fields_of_study

Senior Year

Fall Semester: 14 Credits

- DM-UY 4173 Professional Practices for Creatives *3 Credits*
- DM 2/3/4xxx DM Studio Electives *3 Credits*
- Math, Science, Humanities Elective *4 Credits*
- Free Elective *4 Credits*

Spring Semester: 15 Credits

- DM-UY 4003 Senior Project in Digital Media *3 Credits*
- Math, Science, Humanities Elective *4 Credits*
- Free Elective *4 Credits*
- Free Elective *4 Credits*

Total: 120 Credits

Mathematics, B.S.

Goals and Objectives:

- Command of core areas in both pure and applied mathematics, including but not limited to real and complex analysis, linear algebra, ordinary and partial differential equations.
- Mastery of a particular applied or engineering field and how mathematics is used in that field.

- Readiness for a variety of career options following graduation, including, but not limited to graduate study in applied mathematics, engineering, medicine, as well as professional careers in consulting, business & finance, and technology.

Rationale:

The Tandon B.S. in Mathematics program is designed to provide a student with the knowledge and skills needed to both start a career in a mathematically-oriented field and adapt easily to changes in both the field and one's career directions. The program has the following components:

- A core set of required fundamental mathematics courses
- Mathematics electives
- A cohesive set of courses that focus on a particular field of engineering. The student works together with their advisor to choose these courses appropriately.

Students must complete 126 credits, as defined below, to graduate from the NYU Tandon School of Engineering with a Bachelor of Science in Mathematics. Please note that the curriculum that follows applies to students who began classes in the Fall of 2019 or later. For students who entered the NYU Tandon School of Engineering prior to that date, please review the curriculum and typical course schedule for students entering Fall 2017 - Spring 2019 or the curriculum and typical course schedule for students entering prior to Fall 2017.

The NYU Tandon School of Engineering also offers a Physics and Mathematics, B.S. which is a dual major in both subjects.

Requirements for the Bachelor of Science

Core Mathematics Requirements: 48 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits*
  or MA-UY 1324 Integrated Calculus I for Engineers *4 credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*
  or MA-UY 1424 Integrated Calculus II for Engineers *4 credits*
- MA-UY 3044 Linear Algebra *4 Credits*
  or MA-UY 3034 Applied Linear Algebra *4 credits*
  or MA-UY 3054 Honors Linear Algebra *4 credits*
- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
  or MA-UY 2514 Honors Calculus III *4 Credits*
- MA-UY 4614 Applied Analysis *4 Credits*
  or MA-UY 4644 Honors Analysis I *4 Credits*
- MA-UY 4204 Ordinary Differential Equations *4 Credits*
  or MA-UY 4214 Applied Ordinary Differential Equations *4 credits*
- MA-UY 3014 Applied Probability *4 Credits*
  or MA-UY 3514 Honors Probability *4 Credits*
- MA-UY 4414 Applied Partial Differential Equations *4 Credits*
- MA-UY 4434 Applied Complex Variables *4 Credits*
- MA-UY 4114 Applied Statistics *4 Credits*
- MA-UY 4424 Numerical Analysis *4 Credits*
- MA-UY 4444 Intro to Math Modeling *4 Credits*

Other Required Courses: 27 Credits

- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*

- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Math Electives: 8 Credits

Students should select two math elective courses totaling at least 8 credits.

Other Electives: 28 Credits

- Students are required to take 16 credits in the humanities and social sciences.

Note**:** EXPOS-UA 1 and EXPOS-UA 2 do not count toward the Humanities and Social Sciences Elective requirement of 16 credits.

- 12 credits are reserved for free electives, with advisor's approval.

Required Engineering Components: 15 credits

Students should select four to five engineering courses totaling at least 15 credits in Engineering Components. The Engineering Component of the B.S. in Mathematics Program must be in at least one of the following disciplines:

- Chemical and Biomolecular Engineering
- Civil Engineering
- Computer Engineering
- Computer Science
- Electrical Engineering
- Mechanical Engineering

Interdisciplinary components involving two or more of the fields above will be considered. The courses comprising a math major's engineering component must be approved in advance by an official Mathematics Department advisor.

Sample engineering courses in Engineering Components are listed after the next section.

Total: 126 Credits

Typical Course of Study for the Bachelor of Science in Mathematics

Freshman Year

Fall Semester: 16 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits* OR MA-UY 1324 Integrated Calculus I for Engineers *4 Credits*

- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*

Spring Semester: 15 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits* OR MA-UY 1424 Integrated Calculus II for Engineers *4 Credits*
- MA-UY 3034 Applied Linear Algebra *4 Credits*
  or MA-UY 3044 Linear Algebra
  or MA-UY 3054 Honors Linear Algebra
- PH-UY 1013 Mechanics *3 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Sophomore Year

Fall Semester: 16 Credits

- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- Humanities and Social Sciences Elective #1 *4 Credits*
- Engineering Course #1 *4 credits*

Spring Semester: 16 Credits

- MA-UY 4204 Ordinary Differential Equations *4 Credits*
  or MA-UY 4214 Applied Ordinary Differential Equations
- Math Elective #1 *4 credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- Humanities and Social Sciences Elective #2 *4 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*

Junior Year

Fall Semester: 16 Credits

- MA-UY 3014 Applied Probability *4 Credits*
- MA-UY 4414 Applied Partial Differential Equations *4 Credits*
- Humanities and Social Sciences Elective #3 *4 Credits*
- Engineering Course #2 4 *credits*

Spring Semester: 16 Credits

- MA-UY 4114 Applied Statistics *4 Credits*
- MA-UY 4434 Applied Complex Variables *4 Credits*

- Humanities and Social Sciences Elective #4 *4 Credits*
- Engineering Course #4 *4 Credits*

Senior Year

Fall Semester: 15 Credits

- MA-UY 4614 Applied Analysis *4 Credits*
- MA-UY 4444 Intro to Math Modeling *4 Credits*
- Engineering Course #4 *3 Credits*
- Free Elective #1 4 *Credits*

Spring Semester: 16 Credits

- MA-UY 4424 Numerical Analysis *4 Credits*
- Math Elective #2 4 *Credits*
- Free Elective #2 4 *Credits*
- Free Elective #3 4 *Credits*

Total credits required for the degree: 126 Credits

Sample Engineering Components

Chemical & Biomolecular Engineering

- CBE-UY 1002 Introduction to Chemical and Biomolecular Engineering *2 Credits*
- CBE-UY 2124 Analysis of Chemical and Biomolecular Processes *4 Credits*
- CBE-UY 3153 Chemical and Biomolecular Engineering Thermodynamics *3 Credits*
- CBE-UY 3313 Transport I *3 Credits*
- CBE-UY 3323 Transport II *3 Credits*

Civil Engineering

- CE-UY 2133 Engineering Mechanics *3 Credits*
- CE-UY 2123 Mechanics of Materials *3 Credits*
- CE-UY 2213 Fluid Mechanics and Hydraulics *3 Credits*
- CE-UY 3122 Structural Dynamics *2 Credits*
- CE-UY 3133 Structural Analysis *3 Credits*
- CE-UY 2343 Transportation Engineering *3 Credits*

Computer Engineering

- ECE-UY 2013 Fundamentals of Electric Circuits I *3 Credits*
- ECE-UY 2024 Fundamentals of Electric Circuits II *4 Credits*
- CS-UY 2204 Digital Logic and State Machine Design *4 Credits*

- ECE-UY 4144 Introduction to Embedded Systems Design *4 Credits*

Computer Science

- CS-UY 1134 Data Structures and Algorithms *4 Credits*
- CS-UY 2124 Object Oriented Programming *4 Credits*
- CS-UY 2413 Design and Analysis of Algorithms *3 Credits*
- CS-UY 2xxx or Upper Level Elective *4 Credits*

Electrical Engineering

- ECE-UY 2013 Fundamentals of Electric Circuits I *3 Credits*
- ECE-UY 2024 Fundamentals of Electric Circuits II *4 Credits*
- ECE-UY 3054 Signals and Systems *4 Credits*
- ECE-UY 3114 Fundamentals of Electronics I *4 Credits*
- ECE-UY 3124 Fundamentals of Electronics II *4 Credits*

Mechanical Engineering

- ME-UY 2813 Introduction to Materials Science *3 Credits*
- ME-UY 2811 Materials Science Laboratory *1 Credits*
- ME-UY 2213 Statics *3 Credits*
- ME-UY 2211 Statics Laboratory *1 Credits*
- ME-UY 3333 Thermodynamics *3 Credits*
- ME-UY 3213 Mechanics of Materials *3 Credits*
- ME-UY 3313 Fluid Mechanics *3 Credits*

Mechanical Engineering, B.S.

Typical Course of Study for the Bachelor of Science in Mechanical Engineering

Freshman Year

Fall Semester: 16 Credits

- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*
- MA-UY 1024 Calculus I for Engineers *4 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*

Spring Semester: 16 Credits

- MA-UY 1124 Calculus II for Engineers *4 Credits*
- PH-UY 1013 Mechanics *3 Credits*
- ME-UY 1012 Introduction to Mechanical Engineering *2 Credits*
- CS-UY 1133 Engineering Problem Solving and Programming *3 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Sophomore Year

Fall Semester: 18 Credits

- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- ME-UY 2811 Materials Science Laboratory *1 Credits*
- ME-UY 2813 Introduction to Materials Science *3 Credits*
- ME-UY 2112 Computer Aided Design *2 Credits*
- Humanities and Social Sciences Elective *4 Credits* [1]

Spring Semester: 16 Credits

- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- MA-UY 2224 Data Analysis *4 Credits*
- ME-UY 2211 Statics Laboratory *1 Credits*
- ME-UY 2213 Statics *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*

Junior Year

Fall Semester: 18 Credits

- ME-UY 3333 Thermodynamics *3 Credits*
- ME-UY 3211 Mechanics of Materials Laboratory *1 Credits*
- ME-UY 3213 Mechanics of Materials *3 Credits*
- ME-UY 3511 Measurement Systems Laboratory *1 Credits*
- ME-UY 3513 Measurement Systems *3 Credits*
- ME-UY 3223 Dynamics *3 Credits*
- Humanities and Social Sciences Elective *4 Credits* [1]

Spring Semester: 14 Credits

- ME-UY 3233 Machine Design *3 Credits*
- ME-UY 3311 Fluid Mechanics Laboratory *1 Credits*
- ME-UY 3313 Fluid Mechanics *3 Credits*
- ME-UY 3411 Automatic Control Laboratory *1 Credits*
- ME-UY 3413 Automatic Control *3 Credits*

- STEM[2] Elective *3 Credits*[2]

Senior Year

Fall Semester: 17 Credits

- ME-UY 4112 Senior Design I *2 Credits*
- ME-UY 4214 Finite Element Modeling, Design and Analysis *4 Credits*
- ME-UY 4311 Heat Transfer Laboratory *1 Credits*
- ME-UY 4313 Heat Transfer *3 Credits*
- STEM[2] Elective *3 Credits*[2]
- Humanities and Social Sciences Elective *4 Credits* [1]

Spring Semester: 16 Credits

- ME-UY 4113 Senior Design II *3 Credits*
- Free Elective *3 Credits* [3]
- Free Elective *3 Credits*[3]
- Free Elective *3 Credits*[3]
- Humanities and Social Sciences Elective *4 Credits* [1]

Total credits required for the degree: 131 Credits

Footnotes

[1] Students must take sixteen credits (four courses) of elective courses in the humanities and social sciences. Consult the Department of Technology, Culture and Society portion of the bulletin for details. At least one humanities and social sciences (HuSS) elective must be a 3xxx/4xxx level course. At least one humanities and social sciences elective must be a writing-intensive course, labeled by "W."

[2] STEM[2] electives are satisfied by the following courses:

- a) Any level 2 or higher course starting with the prefix AE-UY, BMS-UY, CBE-UY, CM-UY, CE-UY, CS-UY, ECE-UY, FIN-UY, DM-UY, MA-UY, ME-UY, MG-UY, PH-UY, STS-UY, or VIP-UY
- b) Any graduate course starting with BE-GY, BI-GY, BT-GY, BTE-GY, CBE-GY, CM-GY, CE-GY, CS-GY, FRE-GY, DM-GY, IE-GY, MG-GY, MA-GY, ME-GY, or TR-GY
- Any course which satisfies Humanities credit must be in excess of the NYU Tandon 24 credit Humanities and Social Sciences (HuSS) requirement to be eligible for STEM[2] elective credit. Double-counting HuSS credit and STEM[2] credit is not permitted.

[3] A free elective is any course in any department of the University for which the student has the prerequisites. Free electives may include internships for credit (CP-UY 2xxx or Study Abroad courses). A total of six internship credits may be applied to the BSME degree. Letter graded and pass/fail approved internship courses are allowable. In general, all other Free Electives must be letter graded.

Physics and Mathematics, B.S.

Dual Major in Physics and Mathematics

Students must complete 128 credits, as defined below, to graduate from the School of Engineering with a Bachelor of Science in Mathematics & Physics. Please note that the curriculum that follows applies to students who began classes in the **fall of 2020** or later. If you entered the School of Engineering prior to that date, please consult the curriculum and typical course schedule for students entering spring 2020 or earlier.

The Department of Applied Physics also offers a Minor in Applied Physics and a Concentration and Minor in Nuclear Science and Engineering. A full list of the department's undergraduate offerings is also available.

The core of the program is 32 credits of required physics courses and 31 credits of required math courses. Students pursuing the dual major must also take an additional 8 credits of physics and math electives. 22 credits are reserved for STEM & free electives and independent study courses. The remaining credits are used to satisfy other school, university and state requirements. The curriculum is specified in detail below.

Physics Requirements: 32 Credits

- PH-UY 1013 Mechanics *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2104 Analytical Mechanics *4 Credits*
- PH-UY 2344 Introduction to Modern and Solid State Physics *4 Credits*
- PH-UY 3002 Junior Physics Laboratory *2 Credits*
- PH-UY 3234 Electricity and Magnetism *4 Credits*
- PH-UY 4124 Thermodynamics and Statistical Physics *4 Credits*
- PH-GY 6673 Quantum Mechanics I *3 Credits*

Math Requirements: 31 Credits

- MA-UY 1024 Calculus I for Engineers *4 Credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*
- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
  or MA-UY 2514 Honors Calculus III *4 Credits*
- MA-UY 2224 Data Analysis *4 Credits*
- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- MA-UY 3113 Advanced Linear Algebra and Complex Variables *3 Credits*
- MA-UY 4414 Applied Partial Differential Equations *4 Credits*
- MA-UY 4424 Numerical Analysis *4 Credits*

Other Required Courses: 19 Credits

- PH-UY 1002 Physics: The Genesis of Technology *2 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
  or CM-UY 1014 General Chemistry I *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*

Electives in the Humanities and Social Sciences: 16 Credits

Students are required to take 16 credits in the humanities and social sciences requiring EXPOS-UA 1 and EXPOS-UA 2 as prerequisites. To gain some breadth and depth of knowledge, it is required that you take courses in at least two disciplines and at least one course at an advanced level.

Math and Physics Electives: 8 Credits

Select at least 8 credits from the lists of undergraduate math and physics elective courses. Graduate courses may be substituted with advisor's approval.

- PH-UY 2813 Astronomy and Astrophysics *3 Credits*
- PH-UY 2823 Introduction to Geophysics *3 Credits*
- PH-UY 3054 Introduction to Polymer Physics *4 Credits*
- PH-UY 3103 Fundamentals of Applied Nuclear Physics *3 Credits*
- PH-UY 3474 Introduction to Modern Optics *4 Credits*
- PH-UY 3503 Introduction to Radiation Physics and Dosimetry *3 Credits*
- PH-UY 3513 Nuclear and Radiation Instrumentation and Methods *3 Credits*
- PH-UY 3603 Mathematical Physics *3 Credits*
- PH-UY 3614 Computational Physics *4 Credits*
- PH-UY 3703 Mathematical Physics II *3 Credits*
- PH-UY 4554 Solid State Physics *4 Credits*
- PH-UY 4603 Special Topics in Physics *3 Credits*

STEM and Free Electives, Independent Study and Projects: 22 Credits

22 credits are allocated for STEM & free electives and independent study courses. 8 credits are reserved for a 6 credit physics project plus a 2 credit senior physics seminar course or a 4 credit math project/thesis and an extra 4 credit math elective. The remaining 14 credits are reserved for two 4 credit STEM electives and two 3 credit free electives. The program adviser must approve electives selected from other disciplines.

Typical Course of Study for the Bachelor of Science in Physics & Mathematics

Freshman Year

Fall Semester: 15 Credits

- PH-UY 1002 Physics: The Genesis of Technology *2 Credits*
- MA-UY 1024 Calculus I for Engineers *4 Credits*
- CM-UY 1004 General Chemistry for Engineers *4 Credits*
  or CM-UY 1014 General Chemistry I *4 Credits*
- CM-UY 1014 General Chemistry I *4 Credits*
- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*

Spring Semester: 15 Credits

- PH-UY 1013 Mechanics *3 Credits*
- MA-UY 1124 Calculus II for Engineers *4 Credits*
- CS-UY 1114 Introduction to Programming and Problem Solving *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

Sophomore Year

Fall Semester: 16 Credits

- PH-UY 2023 Electricity, Magnetism and Fluids *3 Credits*
- PH-UY 2121 General Physics Laboratory I *1 Credits*
- MA-UY 2114 Calculus III: Multi-Dimensional Calculus *4 Credits*
- MA-UY 2224 Data Analysis *4 Credits*
- Humanities and Social Science Elective *4 Credits*

Spring Semester: 16 Credits

- PH-UY 2033 Waves, Optics and Thermodynamics *3 Credits*
- PH-UY 2131 General Physics Laboratory II *1 Credits*
- PH-UY 2344 Introduction to Modern and Solid State Physics *4 Credits*
- MA-UY 2034 Linear Algebra and Differential Equations *4 Credits*
- Humanities and Social Science Elective *4 Credits*

Junior Year

Fall Semester: 16 Credits

- PH-UY 2104 Analytical Mechanics *4 Credits*
- MA-UY 4414 Applied Partial Differential Equations *4 Credits*
- STEM Elective *4 Credits*
- Humanities and Social Science Elective *4 Credits*

Spring Semester: 17 Credits

- PH-UY 3234 Electricity and Magnetism *4 Credits*
- PH-UY 3002 Junior Physics Laboratory *2 Credits*
- MA-UY 4424 Numerical Analysis *4 Credits*
- STEM Elective *4 Credits*
- Free Elective 3 *Credits*

Senior Year

Fall Semester: 17 Credits

- PH-GY 6673 Quantum Mechanics I *3 Credits*
- PH-UY 4902 Introduction to Senior Project in Physics *2 Credits*
  or Math Elective *2 Credits*
- PH-UY 4912 Senior Seminar in Physics *2 Credits*
  or Math Elective *2 Credits*
- MA-UY 3113 Advanced Linear Algebra and Complex Variables *3 Credits*
- Humanities and Social Science Elective *4 Credits*
- Free Elective *3 Credits*

Spring Semester: 16 Credits

- PH-UY 4904 Senior Project in Physics *4 Credits*
  or MA-UY 4924 Math Independent Study *4 Credits*
- PH-UY 4124 Thermodynamics and Statistical Physics *4 Credits*
- Math Elective *4 Credits*
- Physics Elective *4 Credits*

Total Credits Required for the Degree: 128

Science and Technology Studies, B.S.

Bachelor of Science Degree Requirements

STS majors take 120 credits, divided into four parts:

1. General Education Requirement: 40 Credits

(a) Texts, Communication and Social Thought Requirement: 2 courses, 8 Credits

i. EXPOS-UA 1 and EXPOS-UA 2 - Writing the Essay and the Advanced College Essay

(b) Free Electives Requirement: 32 Credits

2. Technology/Science Requirement: 40 Credits

The minimum cumulative GPA for this requirement must be 3.0.

(a) Innovation and Problem Solving Requirement: 5 Credits

- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- MA-UY 1024 Calculus I for Engineers *4 Credits* or equivalent

(b) Technology/Science Electives: 35 Credits

35 Technology/Science credits taken from any of the following general fields, at least 15 credits of which must be from the same field (unless otherwise indicated by minor requirements specific to a given department and/or approved by the adviser).

- Biological Sciences
- Chemistry
- Computer Science
- Engineering
- Mathematics
- Applied Physics

3. STS Requirement: 40 Credits

Each class must be passed with a minimum grade of C.

(a) Core: 16 Credits

- STS-UY 1004W Science, Technology, and Society *4 Credits*
- STS-UY 3004W Seminar in Science and Technology Studies *4 Credits*
- STS-UY 4034 Internship *4 Credits*
- STS-UY 4002 Capstone Project I in Science and Technology Studies *2 Credits*
- STS-UY 4202 Capstone Project II in Science and Technology Studies *2 Credits*

(b) Restricted Electives: 24 Credits

6 courses from the Science, Technology, and Society (STS) cluster of Humanities and Social Sciences courses (excluding those taken to fulfill the Core Requirement 3a). These courses include STS-prefixed courses as well as those listed under the STS Cluster in the Humanities and Social Sciences Electives List.

Typical Course of Study for STS Major, Tech/Sci Concentration Undefined

First Year

Fall Semester: 17 Credits

- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- Tech/Sci Elective 1 *4 Credits*
- Free Elective 1 *4 Credits*
- MA-UY 1024 Calculus I for Engineers *4 Credits*

Spring Semester: 16 Credits

- STS-UY 1004W Science, Technology, and Society *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*

- Free Elective 2 *4 Credits*
- Tech/Sci Elective 2 *4 Credits*

Sophomore Year

Fall Semester: 12 Credits

- Tech/Sci Elective 3 *4 Credits*
- Tech/Sci Elective 4 *4 Credits*
- Free Elective 3 *4 Credits*

Spring Semester: 16 Credits

- STS Elective 1 *4 Credits*
- STS Elective 2 *4 Credits*
- Tech/Sci Elective 5 *4 Credits*
- Free Elective 4 *4 Credits*

Junior Year

Fall Semester: 16 Credits

- STS-UY 4034 Internship *4 Credits*
- STS Elective 3 *4 Credits*
- Tech/Sci Elective 6 *4 Credits*
- Free Elective 5 *4 Credits*

Spring Semester: 16 Credits

- STS Elective 4 *4 Credits*
- Free Elective 6 *4 Credits*
- Tech/Sci Elective 7 *4 Credits*
- STS-UY 3004W Seminar in Science and Technology Studies *4 Credits*

Senior Year

Fall Semester: 13 Credits

- STS-UY 4002 Capstone Project I in Science and Technology Studies *2 Credits*
- STS Elective 5 *4 Credits*
- STS Elective 6 *4 Credits*
- Tech/Sci Elective 8 *3 Credits*

Spring Semester: 14 Credits

- STS-UY 4202 Capstone Project II in Science and Technology Studies *2 Credits*
- STS Elective 7 *4 Credits*
- Free Elective 7 *4 Credits*
- Free Elective 8 *4 Credits*

Total credits required for the degree: 120

Sustainable Urban Environments, B.S.

Bachelor of Science Degree Requirements

SUE majors take 120 credits, divided into three parts:

General Education Requirements: 20 Credits

- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*
- General Technical Elective 4 *Credits*
- **(8) Credits of Science:**
  General Science Elective 4 *Credits* **and URB-UY 2334 Introduction to Environmental Sciences**
- **(4) Credits of Statistics- Choose one of the following:**
  MA-UY 2414 Basic Practice of Statistics **or MA-UY 2224 Data Analysis or**
  (CAS) ECON-UA 18, Statistics **or** (CAS) CORE-UA 105, Quantitative Reasoning: Elementary Statistics **or** (CAS) PSYCH-UA 10, Statistics for the Behavioral Sciences **or** (CAS) SOC-UA 302, Statistics for Social Research

Humanities and Social Sciences General Education Requirements: 24 credits

- EXPOS-UA 1 Writing the Essay *4 Credits*
- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- 4 Humanities and Social Sciences courses, including at least one course of Level 3 and one Writing Intensive course

Sustainable Urban Environments Requirements

A. Core: 33 Credits

- CE-UY 1002 Introduction to Civil Engineering *2 Credits*
- URB-UY 2004 Global Perspectives on Urban Sustainability *4 Credits*
- URB-UY 2024W Design of Cities *4 Credits*
- URB-UY 2044 Methods for Studying Urban Environments *4 Credits*
- URB-UY 2054W Introduction to Urban Policy *4 Credits*
- HI-UY 3034 Introduction to Urban Infrastructure History *4 Credits*
- URB-UY 4012 Capstone Project I *2 Credits*

- URB-UY 4022 Capstone Project II *2 Credits*
- URB-UY 4034 Internship *4 Credits*

And one of the following Civil Engineering courses:

- CE-UY 2323 Traffic Engineering I *3 Credits*
- CE-UY 3313 Introduction to Transportation Systems *3 Credits*
- CE-UY 3363 Transportation Economics *3 Credits*
- CE-UY 4033 Introduction to Urban Infrastructure Systems Management *3 Credits*
- CE-UY 4043 Sustainable Cities *3 Credits*

B. Tracks: 4 Courses, 16 Credits

Students should Select at least 1 course from each group

History Group

- CE-UY 3353 History of the New York City Transit System *3 Credits*
  or
- HI-UY 2514W Introduction to New York City History *4 Credits*
- HI-UY 2724 Urban Environmental History *4 Credits*
- HI-UY 4334W Seminar in Urban Infrastructure History *4 Credits*

Social Sciences Group

- PS-UY 2724 Human Factors in Engineering Design *4 Credits*
- PS-UY 3324 Environmental Psychology *4 Credits*
- PS-UY 3724 Psychology of Sustainability *4 Credits*
- PS-UY 3754 Psychology of Living in Extreme Environments *4 Credits*
- URB-UY 2034 Humans in the Urban Environment *4 Credits*
- URB-UY 2114 Geographic Information Systems *4 Credits*
- URB-UY 3354 Urban Impact Assessment *4 Credits*

Environmental Group

- SEG-UY 2184W Beyond Oil: Fueling Tomorrow's Vehicles *4 Credits*
- SEG-UY 2194W Writing About Nature and the Environment *4 Credits*
- URB-UY 2064 Introduction to Urban Planning *4 Credits*
- URB-UY 2224 Natural Environment of New York City *4 Credits*
- URB-UY 2234 Natural Environmental Catastrophes and Cities *4 Credits*
- URB-UY 3034 Evidence-Based Design *4 Credits*
- URB-UY 3214 Cities in Developing Countries *4 Credits*
- URB-UY 3234 Planning for Healthy Cities *4 Credits*
- URB-UY 3314 History and Design of Urban Parks *4 Credits*

Other

- CE-UY 3373 Transportation Systems Analytics *3 Credits*

- URB-UY 3834 Special Topics in Sustainable Urban Environments *4 Credits*
- URB-UY 401X SUE Global Experience *1-4 Credits*

Electives Requirement

A. Technical Electives: 7 Credits

The technical electives requirement can be fulfilled by any course that advances the student's knowledge of, or skills in applied science, engineering, or computer science. Students may choose 3 or 4 credit courses.

*Technical elective overload may be applied to free credits.

B. Free Electives: 20 Credits

Students may choose 5 courses from any department.

Typical Course of Study for the Bachelor of Science in Sustainable Urban Environments

Note: A typical SUE semester is split between two technology/science courses and two humanities/social sciences courses. The flexibility of a SUE major allows many variations, some with heavier technology/science concentrations than others. Each SUE student customizes his or her curriculum in consultation with the program's academic adviser. What follows is one way to fulfill the degree requirements, and this particular plan concentrates electives in the second semester of the third year so that a student can study abroad in one of New York University's global university campuses.

First Year

Fall Semester: 12 Credits

- EXPOS-UA 1 Writing the Essay *4 Credits*
- EG-UY 1001 Engineering and Technology Forum *1 Credits*
- EG-UY 1003 Introduction to Engineering and Design *3 Credits*
- SUE Track Course *4 Credits*

Spring Semester: 14 Credits

- EXPOS-UA 2 The Advanced College Essay *4 Credits*
- CE-UY 1002 Introduction to Civil Engineering *2 Credits*
- URB-UY 2004 Global Perspectives on Urban Sustainability *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*

Second Year

Fall Semester: 16 Credits

- URB-UY 2024 Design of Cities *4 Credits*
- URB-UY 2334 Introduction to Environmental Sciences *4 Credits*
- SUE Track Course *4 Credits*
- Humanities and Social Science Elective *4 Credits*

Spring Semester: 15 Credits

- CE-UY 3303 Traffic Engineering or CE-UY 3313 Introduction to Transportation Systems or CE-UY 4033 Introduction to Urban Infrastructure Systems Management or CE-UY 3363 Transportation Economics
- URB-UY 2044 Methods for Studying Urban Environments *4 Credits*
- SUE Track Course *4 Credits*
- MA-UY 2414 Basic Practice of Statistics *4 Credits* **or** MA-UY 2224 Data Analysis **or** ECON-UA 18- Statistics or CORE-UA 105- Quantitative Reasoning: Elementary Statistics **or** PSYCH-UA 10- Statistics for the Behavioral Sciences **or** SOC-UA 302- Statistics for Social Research

Third Year

Fall Semester: 16 Credits

- Free Elective *4 Credits*
- Free Elective *4 Credits*
- SUE Track Course *4 Credits*
- URB-UY 4034 Internship *4 Credits*

Spring Semester: 16 Credits

- URB-UY 2054W Introduction to Urban Policy *4 Credits*
- Free Elective *4 Credits*
- General Technical Elective *4 Credits*
- HI-UY 3034W History of New York's Urban Infrastructure *4 Credits*

Fourth Year

Fall Semester: 17 Credits

- SUE Track Course *4 Credits*
- Humanities and Social Sciences Elective *4 Credits*
- General Technical Elective *3 Credits*
- Humanities and Social Sciences Elective *4 Credits*
- URB-UY 4012 Capstone Project I *2 Credits*

Spring Semester: 14 Credits

- URB-UY 4022 Capstone Project II *2 Credits*
- Free Elective *4 Credits*
- Free Elective *4 Credits*

- General Technical Elective *4 Credits*

Total credits required for the degree: 120

Graduate Certificate

Bioinformatics (Online) Advanced Certificate

Emerging from unprecedented investigations into biological phenomena over the last decades, the in-demand field of bioinformatics organizes and translates vast streams of data from living organisms generated by the Human Genome Project and other more recent studies. If you are seeking a role as an expert in bioinformatics, you need a thorough appreciation of biology, chemistry, and computer science. This online graduate certificate prepares you to join a talented cadre of creative specialists in the fast-paced pharmaceutical and biotechnology industries.

Students who earn a Bioinformatics Advanced Certificate may apply those credits (up to nine) towards the Bioinformatics Master's Degree.

Curriculum

4 Required Courses (12 Credits)

Required Core Courses (9 Credits)

- BI-GY 7653 Next Generation Sequence Analysis *3 Credits*

Elective Courses (3 Credits)

Please choose 1 elective.

- BI-GY 7633 Transcriptomics *3 Credits*
- BI-GY 7683 Biology and Biotechnology for Bioinformatics *3 Credits*
- BI-GY 7693 Population Genetics and Evolutionary Biology *3 Credits*
- BI-GY 7733 Translational Genomics and Computational Biology *3 Credits*
- BI-GY 7743 Machine Learning and Data Science for Bioinformatics *3 Credits*
- BI-GY 7673 Applied Biostatistics for Bioinformatics *3 Credits*

Construction Management Advanced Certificate

Curriculum

Students must complete at least five courses (15 credits) in accordance with the following requirements:

i. Select at least three courses (9 credits) from those courses that satisfy the Major Requirement for the Master of Science in Construction Management Program and are approved by a Construction Management Program Director; and

ii. Select at least one (3 credits) graduate-level Management (MG) course approved by a Construction Management Program Director.

Grade Requirements

Students must achieve a B (3.0) cumulative average in all graduate courses taken at NYU Tandon School of Engineering.

Executive Construction Management (Exec 21) Advanced Certificate

Curriculum

Students must complete 15 credits of course work to earn a certificate. A minimum of 9 credits must be selected from the Exec 21 Core Courses, and up to 6 credits may be selected from those courses that satisfy the Major Requirement for the Master of Science in Construction Management Program and are approved by a Construction Management Program Director.

Exec 21 Core Courses:

- CE-GY 8703 Managing and Leading in the 21st Century *3 Credits*
- CE-GY 8713 Construction and the Law *3 Credits*
- CE-GY 8723 How to Succeed in Construction *3 Credits*
- CE-GY 8733 Infrastructure Financing: Structuring of a Deal *3 Credits*
- CE-GY 875X Employer Focused Residency *Up to 3 credits Credits*
- CE-GY 8763 Capital Program Management/Program Development *3 Credits*
- CE-GY 8773 Dispute Avoidance and Resolution *3 Credits*
- CE-GY 8783 Construction Management and Planning *3 Credits*
- CE-GY 8803 Infrastructure Planning for Public Works *3 Credits*

Grade Requirements

Students must maintain a B (3.0) cumulative average in all graduate courses taken at NYU Tandon School of Engineering.

Traffic Engineering Advanced Certificate

Advanced Certificate in Traffic Engineering

Curriculum

Students must complete 12 credits of course work to earn an advanced certificate. Seven and a half credits are required courses, One 1.5-credit course plus one three-credit course are chosen from the lists below.

Required Courses

- TR-GY 6053 Transportation Economics and Finance Fundamentals *3 Credits* [1]
- TR-GY 6333 Transportation & Traffic Concepts *3 Credits*
- TR-GY 6343 Traffic Operations & Control *3 Credits*

Select One of the Following:

- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*
- TR-GY 7033 Multimodal Transportation Safety *3 Credits*
- TR-GY 7323 Design of Parking and Terminal Facilities *3 Credits*

Grade Requirements

Students must maintain a B (3.0) cumulative average in all graduate courses taken at NYU Tandon School of Engineering.

Note:

[1] Effective Spring 2019. Students entering the Advanced Certificate program prior to Spring 2019 may take TR-GY 6011 Fundamental Concepts in Transportation *1.5 Credits* and TR-GY 6211 Economic Analysis of Transportation Alternatives *1.5 Credits* in place of TR-GY 6053.

Transportation Management Advanced Certificate

Advanced Certificate in Transportation Management

Curriculum

Students must complete 12 credits of course work to earn an advanced certificate. Nine credits are required courses, plus three credits are chosen from the list of elective courses.

Required Courses

- TR-GY 6053 Transportation Economics and Finance Fundamentals *3 Credits* [1]
- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*
- TR-GY 7223 Management of Transit Maintenance and Operations *3 Credits*
  and select either
- TR-GY 7213 Transportation Management *3 Credits*
  or
- TR-GY 7133 Urban Public Transportation Systems *3 Credits*

Grade Requirements

Students must maintain a B (3.0) cumulative average in all graduate courses taken at NYU Tandon School of Engineering.

Note:

[1] Effective Spring 2019. Students entering the Advanced Certificate program prior to Spring 2019 may take TR-GY 6011 Fundamental Concepts in Transportation *1.5 Credits* and TR-GY 6211 Economic Analysis of Transportation Alternatives *1.5 Credits* in place of TR-GY 6053.

Transportation Planning Advanced Certificate

Advanced Certificate in Transportation Planning

Curriculum

Students must complete 12 credits of course work to earn an advanced certificate. Nine credits are required courses, plus three credits are chosen from the list of elective courses.

Required Courses

- TR-GY 6013 Fundamental Concepts in Transportation *3 Credits*
- TR-GY 6113 Forecasting Urban Travel Demand *3 Credits*
- TR-GY 6333 Transportation & Traffic Concepts *3 Credits*

Select Three Credits from the Following:

- TR-GY 7133 Urban Public Transportation Systems *3 Credits*
- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*
- TR-GY 7033 Multimodal Transportation Safety *3 Credits*

Grade Requirements

Students must maintain a B (3.0) cumulative average in all graduate courses taken at NYU Tandon School of Engineering.

Master of Science

Applied Physics, M.S.

Master of Science in Applied Physics

Admitted students will be expected to have a BS in physics, applied physics, or a closely-related discipline and to make up any deficiencies before commencing graduate studies. Letters of recommendation, undergraduate GPA, GRE and TOEFL scores, and application letters will be considered in the admission process.

Degree Requirements

Completion of the Master of Science in Applied Physics requires a minimum of 30 semester credits. Students are required to take 6 credits of basic core courses (a 3-credit course in quantum mechanics and two semesters of graduate seminar) with the balance of the necessary credits earned in elective courses. The elective courses may include a 6-credit research project or a 9-credit thesis in applied physics. Up to 9 credits of Tandon engineering, science or computer science courses may also be used as electives in the program. Choice of a project or thesis option and of elective courses should be made with the approval of the graduate adviser. As many as 9 transfer credits of physics courses taken outside NYU, or up to 3 suitable courses from the Graduate School of Arts and Sciences may be accepted towards the degree, with the approval of the graduate adviser. No comprehensive examination is required for the master's degree in applied physics.

Minimum Core Course Requirements

- PH-GY 6673 Quantum Mechanics I *3 Credits*
- PH-GY 9531 Graduate Seminar in Physics I *1.5 Credits*
- PH-GY 9541 Graduate Seminar in Physics II *1.5 Credits*

Elective Courses: 24 Credits

Of the elective courses, up to 4 will be allowed at the 5000 level. Suitable applied physics elective courses include:

- PH-GY 5343 Physical Basis of Nanotechnology *3 Credits*
- PH-GY 5443 Physical Techniques and Applications of Nanotechnology *3 Credits*
- PH-GY 5473 Modern Optics *3 Credits*
- PH-GY 5493 Physics of Nanoelectronics *3 Credits*
- PH-GY 5553 Physics of Quantum Computing *3 Credits*
- PH-GY 5663 Physics of Alternative Energy *3 Credits*
- PH-GY 6403 Physical Concepts of Polymer Nanocomposites *3 Credits*
- PH-GY 6513 Introduction to Solid-State Physics I *3 Credits*
- PH-GY 6523 Introduction to Solid-State Physics II *3 Credits*
- PH-GY 6553 Advanced Quantum Computing *3 Credits*
- PH-GY 6683 Quantum Mechanics II *3 Credits*
- PH-GY 8013 Selected Topics in Advanced Physics *3 Credits*
- PH-GY 8023 Selected Topics in Advanced Physics *3 Credits*
- PH-GY 955X Readings in Applied Physics *1-4 Credits*
- PH-GY 996X MS Project in Applied Physics *1-9 Credits*
- PH-GY 997X MS Thesis in Applied Physics *3 Credits*

Total Credits Required: 30

Bioinformatics (Online), M.S.

Bioinformatics

The last decade has seen unprecedented changes in biotech, biomedicine, biomanufacturing, and bioengineering. Most of it is fueled by new genomics and other omics technologies that generate massive amount of data, but also do so at a higher and higher resolution going down to single molecules and single cells. The resulting data need to be interpreted carefully, because a single mutation in a base (e.g., "SNP") could be the cause of a disease. The resulting data is massive, as biotech's Moore's law grows exponentially (doubling every five months in comparison to computers' doubling every eighteen months).

We at Tandon are educating and nurturing tomorrow's biotech rock-stars, who can address infectious diseases (e.g., Zika or Ebola), genetic diseases (e.g., Cancer, Alzheimer or Autism), public health (Personalized Health Care Program, Diabetes or Obesity), agriculture (e.g., GMO, Genetically Modified Organisms) and green technology (e.g., Energy or GHG(Green House Gas)-sequestration.

This NY State approved program meets industry's demand for professionals with solid foundations in genomics, proteomics, and transcriptomics; Algorithms, statistics and biotechnology; programming (Python, Perl and R); data science, AI and ML; sequence and pathway analysis, as well as a host of genome informatics tools and algorithms such as BLAST, BioPython, BioPerl, Bioconductor, and UCSC genome browser.

Tandon also provides a bridge program to prepare students with insufficient background in core computer science before admission.

Students who earn a Bioinformatics Advanced Certificate may apply those credits towards the Bioinformatics Master's Degree. Note that only 9 credits from the Advanced Certificate can be used towards the Bioinformatics Master Degree program.

Required Core Courses (18 Credits)

- BI-GY 7453 Algorithms and Data Structures for Bioinformatics *3 Credits*
- BI-GY 7663 Problem Solving For Bioinformatics *3 Credits*
- BI-GY 7673 Applied Biostatistics for Bioinformatics *3 Credits*
- BI-GY 7683 Biology and Biotechnology for Bioinformatics *3 Credits*
- BI-GY 7723 Statistics and Mathematics for Bioinformatics *3 Credits*
- BI-GY 7743 Machine Learning and Data Science for Bioinformatics *3 Credits*

Choose a Concentration (6 Credits)

Laboratory Science Concentration (Required Courses):

- BI-GY 7543 Proteomics *3 Credits*
- BI-GY 7653 Next Generation Sequence Analysis *3 Credits*

Translational Science Concentration (Required Courses):

- BI-GY 7693 Population Genetics and Evolutionary Biology *3 Credits*
- BI-GY 7733 Translational Genomics and Computational Biology *3 Credits*

Electives

- BI-GY 7573 Special Topics in Informatics in Chemical and Biological Sciences *3 Credits*
- BI-GY 7633 Transcriptomics *3 Credits*

Minimum Total: 30 Credits

Biomedical Engineering, Bioinstrumentation Track, M.S.

The Curriculum

Requirements for the Master of Science

Each track within the BME MS program includes two options. The first specifies course requirements that include research with submission of a master's thesis. The second option specifies course requirements plus research performed as guided studies. Students who choose the master's thesis option must register for 6 credits of BE-GY 997x and then write and defend a master's thesis according to School guidelines. Those students electing the thesis option will also be required to take training in laboratory safety.

Biomedical Engineering-Bioinstrumentation Track

To meet graduation requirements, students must achieve an overall B average in all courses (including MS thesis, research or guided studies) and must not have more than two grades of C in required (core) subjects.

Listed below are required (core) courses for students in the **Bioinstrumentation** track that fulfill the requirements for an MS in Biomedical Engineering.

Required Courses:

- BE-GY 6103 Anatomy, Physiology and Biophysics I *3 Credits*
- BE-GY 6113 Anatomy, Physiology and Biophysics II *3 Credits*
- BE-GY 6303 Bio-optics *3 Credits*
- BE-GY 6503 Bioinstrumentation *3 Credits*
- BE-GY 6403 Digital Signal Processing I *3 Credits*
  Or ECE-GY 6113 Digital Signal Processing I I 3 Credits
- BE-GY 6453 Probability and Stochastic Processes *3 Credits*
  Or ECE-GY 6303 Probability and Stochastic Processes | 3 Credits
- CBE-GY 6153 Applied Mathematics in Engineering *3 Credits*
- BE-GY 9730 Colloquium in Biomedical Engineering *0 Credits*
- BE-GY 9740 Seminar in Biomedical Engineering *0 Credits*

Electives

- You may choose up to 9 credits from the list of electives below, subject to the Research option chosen.

Research Options

- BE-GY 871x Guided Studies in Biomedical Engineering *3-6 Credits, each 3 Credits*
- BE-GY 997x MS Thesis in Biomedical Engineering *6-9 Credits, each 3 Credits*

Total Credits: 30

In addition

Once per year, biomedical engineering MS students must register for Colloquium in Biomedical Engineering (BE-GY 9730, 0 credits) and Seminar in Biomedical Engineering (BE-GY 9740, 0 credits).

For all students in the Bioinstrumentation track, remaining credits (up to 9 credits) must be selected from the list of electives, unless permission is granted by the biomedical engineering graduate adviser to substitute a course not listed below.

Electives

The list below contains the elective courses that are available to students pursuing an MS degree in the Bioinstrumentation track.

- BE-GY 6203 Medical Imaging I *3 Credits*
  Or ECE-GY 6813 Medical Imaging *3 Credits*
- BE-GY 6353 Special Topics in Biomedical Engineering *3 Credits*
- BE-GY 6463 Biostatistics for Biomedical Engineers *3 Credits*
- BE-GY 6603 Drug Delivery *3 Credits*
- BE-GY 6753 Biomechanics and Biomaterials in Orthopaedics *3 Credits*
- BE-GY 6803 Biomaterials: Engineering Principles and Design Considerations *3 Credits*
- BE-GY 871x Guided Studies in Biomedical Engineering *3-6 Credits, each 3 Credits*
- BE-GY 9443 Tissue Engineering *3 Credits*
- BE-GY 9753 Bioethics Seminar *3 Credits*
- BT-GY 6063 Molecular Immunology *3 Credits*
- CM-GY 9433 Protein Engineering *3 Credits*
- CS-GY 6643 Computer Vision *3 Credits*
- ECE-GY 6123 Image and Video Processing *3 Credits*
- ECE-GY 6143 Machine Learning *3 Credits*
- ECE-GY 6183 Digital Signal Processing Laboratory *3 Credits*
- ECE-GY 6483 Real Time Embedded Systems *3 Credits*
- MATH-GA 2852.001 Advanced Topics in Math Biology *4 Credits*
- ME-GY 7863 Special Topics in Mechanical Engineering *3 Credits*
- PH-GY 6403 Physical Concepts of Polymer Nanocomposites *3 Credits*
- BMSC-GA 4404 Fundamental concepts of MRI *3 Credits*
- BMSC-GA 4409 Advanced MRI *3 Credits*
- BMSC-GA 4427 Practical MRI I *6 Credits*
- BMSC-GA 4428 Practical MRI II *6 Credits*
- BMSC-GA 4469 Positron Emission Tomography *3 Credits*

Biomedical Engineering, Biomaterials Track, M.S.

The Curriculum

Requirements for the Master of Science

Each track within the BME MS program includes two options. The first specifies course requirements that include research with submission of a master's thesis. The second option specifies course requirements plus research performed as guided studies. Students who choose the master's thesis option must register for 6 credits of BE-GY 997x and then write and defend a master's thesis according to School guidelines. Those students electing the thesis option will also be required to take training in laboratory safety.

Biomedical Engineering-Biomaterials Track

To meet graduation requirements, students must have an overall B average in all courses (including MS thesis, research or guided studies) and must not have more than two grades of C in required (core) subjects.

Required courses for all students in the **Biomaterials** Track that fulfill their requirements for an MS in Biomedical Engineering are shown below:

Required Courses

- BE-GY 6103 Anatomy, Physiology and Biophysics I *3 Credits*
- BE-GY 6113 Anatomy, Physiology and Biophysics II *3 Credits*
- BE-GY 6463 Biostatistics for Biomedical Engineers *3 Credits*
- BE-GY 6753 Biomechanics and Biomaterials in Orthopaedics *3 Credits*
- BE-GY 6803 Biomaterials: Engineering Principles and Design Considerations *3 Credits*
- BE-GY 9443 Tissue Engineering *3 Credits*
- BE-GY 9730 Colloquium in Biomedical Engineering *0 Credits*
- BE-GY 9740 Seminar in Biomedical Engineering *0 Credits*
- BT-GY 6063 Molecular Immunology *3 Credits*
- CM-GY 9433 Protein Engineering *3 Credits*

Electives

- You may choose up to 6 credits from the list of electives below, subject to the Research option chosen.

Research Options

- BE-GY 871x Guided Studies in Biomedical Engineering *3-6 Credits, each 3 Credits*
- BE-GY 997x MS Thesis in Biomedical Engineering *6-9 Credits, each 3 Credits*

Total Credits: 30

In addition

Once per year, biomedical engineering MS students must register for Colloquium in Biomedical Engineering (BE- GY 9730, 0 credits) and Seminar in Biomedical Engineering (BE-GY 9740, 0 credits).

For all students in the Biomaterials track, remaining credits (up to 6) must be selected from the list of electives unless permission is granted by the biomedical engineering graduate adviser to substitute a course not listed below.

Electives

The list below contains the elective courses that are available to students pursuing an MS degree in the Biomaterials track.

- BE-GY 6203 Medical Imaging I *3 Credits*
  or ECE-GY 6813 Medical Imaging *3 Credits*
- BE-GY 6303 Bio-optics *3 Credits*
- BE-GY 6353 Special Topics in Biomedical Engineering *3 Credits*
- BE-GY 6403 Digital Signal Processing I *3 Credits*
  or ECE-GY 6113 Digital Signal Processing I *3 Credits*
- BE-GY 6453 Probability and Stochastic Processes *3 Credits*
  or ECE-GY 6303 Probability and Stochastic Processes *3 Credits*
- BE-GY 6503 Bioinstrumentation *3 Credits*
- BE-GY 6603 Drug Delivery *3 Credits*
- BE-GY 871x Guided Studies in Biomedical Engineering *3-6 Credits, each 3 Credits*
- BE-GY 9753 Bioethics Seminar *3 Credits*
- CBE-GY 6153 Applied Mathematics in Engineering *3 Credits*
- CS-GY 6643 Computer Vision *3 Credits*
- ECE-GY 6123 Image and Video Processing *3 Credits*
- ECE-GY 6143 Machine Learning *3 Credits*
- ECE-GY 6183 Digital Signal Processing Laboratory *3 Credits*
- ECE-GY 6483 Real Time Embedded Systems *3 Credits*
- MA-GA 2852.001 Advanced Topics in Math Biology *4 Credits*
- ME-GY 7863 Special Topics in Mechanical Engineering *3 Credits*
- PH-GY 6403 Physical Concepts of Polymer Nanocomposites *3 Credits*
- BMSC-GA 4404 Fundamental concepts of MRI *3 Credits*
- BMSC-GA 4409 Advanced MRI *3 Credits*
- BMSC-GA 4427 Practical MRI I *6 Credits*
- BMSC-GA 4428 Practical MRI II *6 Credits*
- BMSC-GA 4469 Positron Emission Tomography *3 Credits*

Biomedical Engineering, Medical Imaging Track, M.S.

The Curriculum

Requirements for the Master of Science

Each track within the BME MS program includes two options. The first specifies course requirements that include research with submission of a master's thesis. The second option specifies course requirements plus research performed as guided studies. Students who choose the master's thesis option must register for 6 credits of BE-GY 997x and then write and defend a master's thesis according to School guidelines. Those students electing the thesis option will also be required to take training in laboratory safety.

Biomedical Engineering—Medical Imaging Track

To meet graduation requirements, students must achieve an overall B average in all courses (including MS thesis, research or guided studies) and must not have more than two grades of C in required (core) subjects.

Listed below are required (core) courses for students in the **Medical Imaging** track that fulfill the requirements for an MS in Biomedical Engineering.

Required Courses:

- BE-GY 6103 Anatomy, Physiology and Biophysics I *3 Credits*
- BE-GY 6113 Anatomy, Physiology and Biophysics II *3 Credits*
- BE-GY 6403 Digital Signal Processing I *3 Credits* OR ECE-GY 6113 Digital Signal Processing I *3 Credits*
- BE-GY 6203 Medical Imaging I *3 Credits* OR ECE-GY 6813 Medical Imaging *3 Credits*
- BE-GY 6453 Probability and Stochastic Processes *3 Credits*
- ECE-GY 6303 Probability and Stochastic Processes *3 Credits*
- ECE-GY 6123 Image and Video Processing *3 Credits*
- CBE-GY 6153 Applied Mathematics in Engineering *3 Credits*
- BE-GY 9730 Colloquium in Biomedical Engineering *0 Credits*
- BE-GY 9740 Seminar in Biomedical Engineering *0 Credits*

Electives

- You may choose up to 9 credits from the list of electives below, subject to the Research option chosen.

Research Options

- BE-GY 871x Guided Studies in Biomedical Engineering *3-6 Credits, each 3 Credits*
- BE-GY 997x MS Thesis in Biomedical Engineering *6-9 Credits, each 3 Credits*

Total Credits: 30

In addition

Once per year, biomedical engineering MS students must register for Colloquium in Biomedical Engineering (BE-GY 9730, 0 credits) and Seminar in Biomedical Engineering (BE-GY 9740, 0 credits).

For all students in the Medical Imaging track, remaining credits (up to 9 credits) must be selected from the list of electives, unless permission is granted by the biomedical engineering graduate adviser to substitute a course not listed below.

Electives

The list below contains the elective courses that are available to students pursuing an MS degree in the Medical Imaging track.

- BE-GY 6303 Bio-optics *3 Credits*
- BE-GY 6353 Special Topics in Biomedical Engineering *3 Credits*
- BE-GY 6463 Biostatistics for Biomedical Engineers *3 Credits*

- BE-GY 6503 Bioinstrumentation *3 Credits*
- BE-GY 6603 Drug Delivery *3 Credits*
- BE-GY 6753 Biomechanics and Biomaterials in Orthopaedics *3 Credits*
- BE-GY 6803 Biomaterials: Engineering Principles and Design Considerations *3 Credits*
- BE-GY 871x Guided Studies in Biomedical Engineering *3-6 Credits, each 3 Credits*
- BE-GY 9443 Tissue Engineering *3 Credits*
- BE-GY 9753 Bioethics Seminar *3 Credits*
- BT-GY 6063 Molecular Immunology *3 Credits*
- CM-GY 9433 Protein Engineering *3 Credits*
- CS-GY 6643 Computer Vision *3 Credits*
- ECE-GY 6143 Machine Learning *3 Credits*
- ECE-GY 6183 Digital Signal Processing Laboratory *3 Credits*
- ECE-GY 6483 Real Time Embedded Systems *3 Credits*
- MA-GA 2852.001 Advanced Topics in Math Biology *4 Credits*
- ME-GY 7863 Special Topics in Mechanical Engineering *3 Credits*
- PH-GY 6403 Physical Concepts of Polymer Nanocomposites *3 Credits*
- BMSC-GA 4404 Fundamental concepts of MRI *3 Credits*
- BMSC-GA 4409 Advanced MRI *3 Credits*
- BMSC-GA 4427 Practical MRI I *6 Credits*
- BMSC-GA 4428 Practical MRI II *6 Credits*
- BMSC-GA 4469 Positron Emission Tomography *3 Credits*

Biotechnology and Entrepreneurship, M.S.

Requirements for the Masters of Science

Students entering this program should have an undergraduate degree in a science or engineering discipline and must have taken undergraduate courses in biochemistry and cell and molecular biology. The 30-credit curriculum of this program comprises three parts:

1. Four required courses offering a broad overview of cutting-edge areas of biotechnology: biocatalysis and biomaterials, biotechnology and health care, biosensors and biochips, biotechnology and the pharmaceuticals industry (12 credits).
2. One required and a wide choice of elective 1.5- and 3-credit courses on technology innovation, intellectual-property management, finances, marketing, business-plan preparation and fund-raising (12 credits).
3. Two more electives up to 6 credits or an optional project involving either technology-competition analysis and business-plan preparation or a placement in an early-stage start-up company (6 credits).

To meet graduation requirements, students must attain an overall GPA of 3.0 (average of a B) in all their courses and at least a B- in each of the required courses. Students also must take at least 15, but no more than 20, credits of Biotechnology or related courses, including 4 required courses, listed below.

Required Courses: 15 Credits

The five required courses are listed below:

- BTE-GY 6013 Biotechnology and the Pharmaceutical Industry *3 Credits*
- BTE-GY 6023 Biotechnology and Health Care *3 Credits*
- BTE-GY 6033 Biosensors and Biochips *3 Credits*

- BTE-GY 6043 Biocatalysis in Industry *3 Credits*
- MG-GY 7703 Entrepreneurship *3 Credits*

Elective Courses: 6-15 Credits

Students must take courses from the list below, which will amount to at least 6 credits in total; e.g., two 3-credit or four 1.5-credit courses:

- BT-GY 6053 Introduction to Neuroscience for Biotechnologists *3 Credits*
- BT-GY 6063 Molecular Immunology *3 Credits*
- BT-GY 6093 Biomedical Materials & Devices for Human Body Repair *3 Credits*
- BT-GY 7013 Special Topics in Biotechnology *3 Credits*
- BT-GY 7033 Business Concepts for the Biotechnology Entrepreneur *3 Credits*
- BT-GY 7043 Computer-Aided Protein and Drug Design *3 Credits*
- BT-GY 9433 Protein Engineering *3 Credits*
- BT-GY 9443 Tissue Engineering *3 Credits*
- MG-GY 6013 Organizational Behavior *3 Credits*
- MG-GY 6073 Marketing *3 Credits*
- MG-GY 6083 Economics *3 Credits*
- MG-GY 6093 Accounting & Finance *3 Credits*
- MG-GY 6103 Management Science *3 Credits*
- MG-GY 6123 Human Resource Management *3 Credits*
- MG-GY 6303 Operations Management *3 Credits*
- MG-GY 7953 Global Innovation *3 Credits*
- MG-GY 8203 Project Management *3 Credits*
- MG-GY 8273 Contracts and Specifications *3 Credits*
- MG-GY 8643 New Product Development *3 Credits*
- MG-GY 8653 Managing Technological Change and Innovation *3 Credits*
- MG-GY 8673 Technology Strategy *3 Credits*

Note:

Subject to advisor's approval students can also take an elective course at other Schools of NYU (up to 9 credits). For example, Biotechnology and Entrepreneurship students can select a course at NYU Stern School of Business.

Projects

Students may take up to three Projects in Biotechnology and Entrepreneurship:

- BTE-GY 950x Project in Biotechnology and Entrepreneurship *0.5-3 Credits*
- BTE-GY 9513 Project in Biotechnology and Entrepreneurship *3 Credits*
- BTE-GY 9523 Project in Biotechnology and Entrepreneurship *3 Credits*

Note:

Projects in Biotechnology and Entrepreneurship count as elective courses.

Total: 30 Credits

Biotechnology, M.S.

Requirements for the Masters of Science

Students are expected to have an undergraduate degree in a science or engineering discipline and must have taken undergraduate courses in (1) biochemistry and (2) cell and molecular biology, or they may take these classes at the NYU Tandon School of Engineering. The 30-credit curriculum consists of three parts:

1. Five required courses in biotechnology, protein and tissue engineering, enzyme catalysis and biosensors (15 credits);
2. Three elective courses in biotechnology and related fields (9 credits); and
3. Two more elective courses or Guided Studies in Biotechnology, involving laboratory or literature work (6 credits).

To meet graduation requirements, students must attain an overall GPA of 3.0 (average of a B) in all their courses.

Required Courses: 15 Credits

The five required courses are listed below:

- BT-GY 6013 Biotechnology and the Pharmaceutical Industry *3 Credits*
- BT-GY 6023 Biotechnology and Health Care *3 Credits*
- BT-GY 6033 Biosensors and Biochips *3 Credits*
- BT-GY 6043 Biocatalysis in Industry *3 Credits*

Choose one of the following:

- BT-GY 6093 Biomedical Materials & Devices for Human Body Repair *3 Credits*
- BT-GY 9433 Protein Engineering *3 Credits*

Elective Courses: 9-15 Credits

Students must select courses from the following list:

- BE-GY 6013 Molecular Immunology *3 Credits*
- BT-GY 6053 Introduction to Neuroscience for Biotechnologists *3 Credits*
- BT-GY 6063 Molecular Immunology *3 Credits*
- BT-GY 6073 Genetic Engineering *3 Credits*
- BT-GY 6083 Advanced Cell and Molecular Biology *3 Credits*
- BT-GY 7011 Special Topics in Biotechnology *1.5 Credits*
- BT-GY 7013 Special Topics in Biotechnology *3 Credits*
- BT-GY 7033 Business Concepts for the Biotechnology Entrepreneur *3 Credits*
- BT-GY 7043 Computer-Aided Protein and Drug Design *3 Credits*
- BT-GY 9053 Enzyme Catalysis in Organic Synthesis *3 Credits*
- BT-GY 9443 Tissue Engineering *3 Credits*

Note:

Subject to advisor's approval students can also take an elective course and/or do research at other Schools of NYU (up to 9 credits). Typically, Biotechnology students choose NYU School of Medicine.

Guided Studies: up to 6 Credits

Students may optionally enroll in up to two Guided Studies courses (one per semester), which involve laboratory or literature work, as arranged with their advisers. Guided Studies courses count as elective courses.

- BT-GY 871X Project in Biotechnology *0.5-3 Credits*
- BT-GY 8713 Guided Studies in Biotechnology I *3 Credits*
- BT-GY 8723 Project in Biotechnology *3 Credits*

Total: 30 Credits

Chemical Engineering, Guided Studies Option, M.S.

Requirements for the Master of Science in Chemical Engineering

Candidates for the MS in Chemical Engineering should plan their programs in accordance with the following list of requirements:

Guided Studies Option

- CBE-GY 902X Guided Studies in Chemical Engineering *3 Credits each, 6 Credits total*

Required (core) courses, 12 credits, 3 credits each

- CBE-GY 6153 Applied Mathematics in Engineering *3 Credits*
- CBE-GY 6333 Transport Phenomena *3 Credits*
- CBE-GY 6733 Chemical Engineering Thermodynamics *3 Credits*
- CBE-GY 6813 Chemical Reactor Analysis and Design *3 Credits*

Electives: 12 Credits

At least two electives (6 credits) must be chosen from approved CBE graduate courses, 6000-level and above, while the other two (6 credits) may be chosen from other graduate programs with the approval of the graduate adviser in chemical engineering.

Total: 30 Credits

Note:

To meet graduation requirements, students must have an overall B average in all courses (excluding MS Thesis or Guided Study Project) and must not obtain more than two grades of C in required subjects.

Chemical Engineering, Thesis Option, M.S.

Requirements for the Master of Science in Chemical Engineering

Candidates for the MS in Chemical Engineering should plan their programs in accordance with the following list of requirements:

Thesis Option

- CBE-GY 997X MS Thesis in Chemical & Biological Engineering *(9 credits total, 3 each) Credits*

Required (core) courses, 12 credits, 3 credits each

- CBE-GY 6153 Applied Mathematics in Engineering *3 Credits*
- CBE-GY 6333 Transport Phenomena *3 Credits*
- CBE-GY 6733 Chemical Engineering Thermodynamics *3 Credits*
- CBE-GY 6813 Chemical Reactor Analysis and Design *3 Credits*

Electives: 9 Credits

At least two electives (6 credits) must be chosen from approved CBE graduate courses, 6000-level and above, while the other one (3 credits) may be chosen from other graduate programs with the approval of the graduate adviser in chemical engineering.

Total: 30 Credits

Note:

To meet graduation requirements, students must have an overall B average in all courses (excluding MS Thesis or Guided Study Project) and must not obtain more than two grades of C in required subjects.

Civil Engineering, M.S.

Master of Science Program in Civil Engineering

The Master of Science in Civil Engineering allows students to specialize in one of the following six areas of concentration:

- Construction Management and Engineering
- Structural Engineering
- Geotechnical Engineering
- Environmental and Water Resources Engineering

- Urban Systems Engineering and Management
- Highway and Traffic Engineering

Students also may elect to follow a general program by taking two courses across several areas of concentration. The Department of Civil and Urban Engineering also offers graduate programs in transportation planning and engineering and transportation management (see the Transportation section in this catalog), environmental science and engineering (see Environmental Engineering and Science section in this catalog), construction management and engineering (see the Construction Management section of this catalog), and urban systems engineering and management (see Urban Infrastructure Systems section in this catalog).

Goals and Objectives

The degree MS in Civil Engineering prepares graduates to practice their profession at an advanced level. Specific program objectives are to provide the skills and knowledge necessary to:

- Specialize in one of the primary subdisciplines of civil engineering or to achieve depth across a number of the subdisciplines;
- Design and analyze civil engineering infrastructure;
- Understand civil engineering materials, technologies and processes as applied to modern civil engineering infrastructure;
- Obtain civil engineering project management skills; and
- Provide a basis for continued, lifelong learning in the civil engineering profession.

Admission

Students seeking admission to the MS program should hold a bachelor's degree in civil engineering from a program accredited by the Accreditation Board for Engineering and Technology (ABET) and have a 3.0 GPA or better. Applicants lacking a BS from an ABET-accredited program in civil engineering (including those possessing undergraduate degrees in other engineering disciplines, engineering science, engineering technology and architecture, or from a foreign university) have their qualifications reviewed by a graduate adviser. Admission may be granted and may include the requirement for additional undergraduate courses to correct deficiencies. These additional courses are not counted toward the MS degree, nor are undergraduate courses included in computing graduate grade-point averages.

Applicants to the MS program should take the Graduate Record Examination (GRE Advanced Tests) and achieve a minimum grade of 155 (700 on the previous scale) on the quantitative section. Applicants from universities outside the United States must take the Test of English as a Foreign Language (TOEFL) and achieve a minimum grade of 80.

International candidates who meet all other admission requirements but who fail to satisfy the TOEFL requirement may be required to take remedial courses in English before admission.

Grade Requirements

To earn a MS degree from NYU Tandon School of Engineering, students must maintain a B average (3.0 GPA) or better in (1) all graduate courses taken at NYU Tandon School of Engineering, (2) all graduate courses taken in the Department of Civil Engineering and (3) all graduate guided studies (readings, project, thesis). Poor scholastic performance (under 3.0 GPA) may lead to a student being placed on graduate probation. If a student's grade do not improve, (s)he may be disqualified from further graduate study in the department.

In the event that an applicant is required to take undergraduate prerequisite courses as a condition of admission, a grade of B- or better is required for every prerequisite course taken, and the cumulative GPA of all required prerequisite courses must be at least 3.0.

Advising

Students are responsible for following the departmental rules outlined in this catalog. While academic advisers consult with and advise students, students are responsible for ensuring that all degree requirements are fulfilled and for submitting all proper forms and applications.

Students must meet with an academic adviser when they first enroll. Students must have a detailed program of study formally approved by an academic adviser before registration.

The academic adviser also handles requests for waivers of certain degree requirements, where warranted. Such waivers must be in writing and must be entered into the student's departmental record. Where specific courses are waived, approval of the course instructor may also be required. When waivers are granted, students may be required to take other specific courses in their place or to select additional electives. Students registering for guided studies (readings, projects, theses) are assigned advisers for each such activity. To register for guided study, students must submit written proposals for the topic(s) to be covered to such advisers before registration. To register, students must obtain written approval of the project adviser and the academic adviser.

Transfer Credits

The residency requirement for the MS degree is 24 credits. Students may transfer up to 6 credits of acceptable courses toward a MS degree, subject to their academic adviser's approval. To be transferred, the course(s) must relate to the student's program and be from an accredited institution. A grade of B or better is required for granting of transfer credit. Courses graded on a pass/fail basis are not considered for transfer unless accompanied by a detailed written evaluation by the course instructor. All transfer requests must be accompanied by an official transcript from the transferring institution. Applications for transfer credits must be submitted for consideration before the end of the first semester of matriculation.

Validation credits by examination may not be used toward any civil engineering graduate degree program.

Degree Requirements

All MS (Civil Engineering) students must complete either the single area of concentration or general program requirements as described in Table 3:

Table 3: Avenues for Obtaining MS (Civil Engineering)

Students Selecting a Single Area of Concentration

Core Courses:	12 credits (min.)
Courses Within Concentration:	12 credits (min.)
Technical Electives:	6 credits

Students Selecting the General Program

Core Courses:	12 credits (min.)
Two Courses in each of 3 Concentration Areas:	18 credits (min.)

Credits Required for MS Degree: 30 credits

A. Core Courses: 12 Credits

Students must complete at least four of the following six core courses.

Table 4: Core Courses in Civil Engineering

- CE-GY 6023 Materials for Civil Engineers *3 Credits*
- CE-GY 6073 Instrumentation, Monitoring and Condition Assessment of Civil Infrastructure *3 Credits*
- CE-GY 7673 Environmental Impact Assessment *3 Credits*
- CE-GY 7843 Urban Infrastructure Systems Management *3 Credits*
- CE-GY 8253 Project Management for Construction *3 Credits*
- CE-GY 8283 Risk Analysis *3 Credits*

B. Concentration Area Courses: 12 to 18 Credits

Students selecting a single area of concentration must complete: (1) at least one core course in their concentration area; and (2) at least four additional concentration area courses. The course requirements of various concentration areas are listed in Tables 5-10. All students must satisfy all course prerequisites.

C. Technical Electives: 0 to 6 Credits

Depending upon the choice of concentration area, a student may have up to an additional 6 credits of course work, which may be satisfied from the following:

Electives:

Electives are normally selected from the courses given by the Department of Civil and Urban Engineering. However, electives may be selected from courses offered by other departments with written consent of the graduate adviser.

Project:

- CE-GY 9963 MS Project in Civil & Urban Engineering *3 Credits*

Thesis:

- CE-GY 997X Thesis for MS in Civil Engineering *6 Credits*

Table 5: Geotechnical Engineering Concentration

Select courses from:

- CE-GY 8423 Ground Improvement *3 Credits*
- CE-GY 8663 Advanced Foundation Design *3 Credits*
- CE-GY 8673 Excavation Support Systems *3 Credits*
- CE-GY 8403 Geotechnics and Geomaterials *3 Credits*
- CE-GY 8433 Urban Geotechnology *3 Credits*
- CE-GY 8493 Environmental Geotechnology *3 Credits*
- CE-GY 7233 Groundwater Hydrology and Pollution *3 Credits*
- CE-GY 8603 Selected Topics in Geotechnical Engineering *3 Credits*

Table 6: Structural Engineering Concentration

- CE-GY 6013 Theory of Structural Analysis and Design *3 Credits*
- CE-GY 6163 Finite Element Methods *3 Credits*
- CE-GY 6033 Selected Topics in Structural Analysis I *3 Credits*
- CE-GY 6043 Selected Topics in Structural Analysis II *3 Credits*
- CE-GY 6063 Bridge Engineering *3 Credits*
- CE-GY 6133 Stability of Structures *3 Credits*
- CE-GY 6143 Steel Structures *3 Credits*
- CE-GY 6183 Concrete Structures *3 Credits*
- CE-GY 6193 Wind and Earthquake Engineering *3 Credits*
- CE-GY 6253 Structural Dynamics *3 Credits*
- CE-GY 6263 Analysis and Design of Tall Buildings *3 Credits*

Table 7: Construction Management and Engineering Concentration

Graduate Construction Management and Engineering courses, including Exec 21 courses, are listed in the Construction Management, M.S. section of this catalog.

Table 8: Environmental/Water Resources Engineering Concentration

Select courses from:

- CE-GY 6053 Monitoring Cities *3 Credits*
- CE-GY 7223 Hydrology *3 Credits*
- CE-GY 7233 Groundwater Hydrology and Pollution *3 Credits*
- CE-GY 7373 Environmental Chemistry and Microbiology *3 Credits*
- CE-GY 7423 Water and Wastewater Treatment *3 Credits*
- CE-GY 7353 Selected Topics in Water Resources and Hydraulic Engineering I *3 Credits*
- CE-GY 7393 Advanced Environmental Chemistry and Microbiology *3 Credits*
- CE-GY 7433 Advanced Water and Wastewater Treatment *3 Credits*
- CE-GY 7453 Water and Wastewater Treatment Laboratory *3 Credits*
- CE-GY 7473 Modeling Fate and Transport of Surface Water Pollution *3 Credits*
- CE-GY 7533 Hazardous/Toxic Waste Management *3 Credits*
- CE-GY 7703 Solid Waste Management *3 Credits*
- CE-GY 7753 Environmental Systems Management *3 Credits*
- CE-GY 8493 Environmental Geotechnology *3 Credits*

Table 9: Highway and Traffic Engineering Concentration

Select courses from:

- TR-GY 6013 Fundamental Concepts in Transportation *3 Credits*
- TR-GY 6113 Forecasting Urban Travel Demand *3 Credits*
- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*
- TR-GY 6333 Transportation & Traffic Concepts *3 Credits*
- TR-GY 6343 Traffic Operations & Control *3 Credits*
- TR-GY 7033 Multimodal Transportation Safety *3 Credits*
- TR-GY 7123 Management of Urban Traffic Congestion *3 Credits*
- TR-GY 7323 Design of Parking and Terminal Facilities *3 Credits*
- TR-GY 7343 Urban Freeways and Intercity Highways *3 Credits*

Table 10: Urban Systems Engineering and Management Concentration

Select courses from:

- CE-GY 7813 Infrastructure Planning, Engineering and Economics *3 Credits*
- CE-GY 7853 Infrastructure Asset Management *3 Credits*
- CE-GY 6073 Instrumentation, Monitoring and Condition Assessment of Civil Infrastructure *3 Credits*
- CE-GY 7753 Environmental Systems Management *3 Credits*
- CE-GY 8713 Construction and the Law *3 Credits* *
- CE-GY 8733 Infrastructure Financing: Structuring of a Deal *3 Credits* *
- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*

Footnote

** Students must meet the requirements for enrollment in Exec 21 courses.*

Computer Engineering (Online), M.S.

Description

Computer engineers participate in some of the most forward-looking work in industry and government today, particularly telecommunications, computer networks and microelectronics. Students become resourceful experts in such dynamic fields as computer networks, VLSI design and testing, embedded systems design and computer architecture. Focusing on principles and concepts underlying the design and integration of hardware and software components and systems, this online master's in computer engineering gives students what they must know to become serious professionals, practitioners confident in electronically controlled systems and devices.

Group 1 (6 Credits): Required Courses

Core Courses-Choose 3 Out of Following

- ECE-GY 6473 Introduction to VLSI System Design *3 Credits*
- ECE-GY 6463 Advanced Hardware Design *3 Credits*

- CS-GY 6133 Computer Architecture I *3 Credits*

Group 2 (21 Credits)

Other graduate ECE and CSE courses (courses with ECE and CS prefixes). With adviser approval up to two courses pertinent to computer engineering can be taken from other departments at NYU.

Group 3 (3 Credits): Project Requirement

One 3-credit advanced project in ECE/CSE (ECE-GY 9953 or CS-GY 9963) is required.

MS Thesis Option (6 Credits)

A thesis in ECE/CSE (ECE-GY 997x/CS-GY 997X) may be selected to replace the 3-credit Advanced Project and a course from Group 2 above.

Transfer Credits

No transfer credits are accepted towards the MS degree.

Minimum Total: 30 Credits

Computer Engineering, M.S.

Degree Requirements

Entrance Requirements

Admission to the MS program requires a bachelor's degree in computer engineering, electrical engineering or computer science from an accredited institution. Students without such prior degrees must complete appropriate undergraduate courses to remove any deficiencies in preparation. Topics in which deficiencies must be removed include logic circuits design, state analysis and synthesis techniques, computer architecture, data structures and algorithms and C or C++ programming. The Graduate Record Exam (GRE) is required for all applicants.

Course Requirements

To obtain the MS degree in Computer Engineering, students must complete a total of 30 credits, with restrictions described below.

Core Courses (6 Credits):

The core courses cover fundamental material and should be taken as early as possible. An advanced course subsequent to a core course may be taken in lieu of the core course, upon by the program advisor. All students must choose two out of the following core courses:

- ECE-GY 6913 Computing Systems Architecture *3 Credits*
- ECE-GY 6463 Advanced Hardware Design *3 Credits*
- ECE-GY 6473 Introduction to VLSI System Design *3 Credits*
- ECE-GY 6483 Real Time Embedded Systems *3 Credits*
- ECE-GY 5373 Internet Architecture and Protocols *3 Credits*
  (Note that ECE-GY 6913 is a newly developed course that replaces CS-GY 6133 Computer Architecture I as a core course. ECE students interested in computer architecture should take this course instead of CS-GY 6133. CS-GY 6133 will be approved as a core course for MS-CE only if it was taken prior to Fall 17.)

Electives (24 Credits):

At least 24 out of 30 credits should be ECE-GY prefixed courses including the core courses. Up to two non-ECE courses (equivalent to six credits) can be taken from other science, engineering, or management departments at NYU. The total number of credits for 5000-level ECE courses and non-ECE courses cannot exceed 12 credits. Note that CP-GY 9911 and CP-GY 9921 can be counted towards the ECE-GY course requirement. Furthermore, credits from 5000-level courses from other departments cannot be counted towards MS/CE degree, except with approval by Program Director.

Project requirement (3 Credits):

One 3-credit advanced project in ECE/CSE (ECE-GY 9953 or CS-GY 9963) is required. Certain courses with significant project component may be used to partially satisfy the project requirement, subject to approval by the program director.

Note about CS-GY 6843 Computer Networking:

We expect most students have covered this material in an undergraduate course. Therefore students can only take this course in exceptional cases and only if approved by Professor Yong Liu.

Thesis, project, and reading

Students are encouraged to participate in research by registering for a master's thesis (ECE-GY 997x , 6 credits, can be taken over two semesters), an advanced project (ECE-GY 9953 or ECE-GY 9963, 3 credits each, ECE-GY 9941, 1.5 credits) or a reading course (ECE-GY 9933, 3 credits). Students must secure a faculty member's commitment for advising such individual studies. Oral defense of the master's thesis with at least three professors (at least 2 ECE professors) in attendance is required. For the project and reading courses, a project report and an oral presentation is required. The total credits for thesis, projects, readings, and internships (see below) should not exceed 9 credits within the 30 credits required for the MS degree.

Internships:

International students must register for an internship course (CP-GY 9911, CP-GY 9921, 1.5 credit each) to do an internship. Up to 3 credits of approved internships can be applied towards the 30 credits MS degree requirement. International students cannot do internship after they have completed the degree requirement. For an internship to be approved for credits, the internship job must provide industry and/or research experience relevant to the Electrical Engineering degree program. All internships must be approved and supervised by an ECE faculty member. Students must secure a faculty member's commitment for advising an internship. The internship supervisor should submit a midterm and a final term evaluation report to the advisor. The student must submit a project report to the faculty advisor upon completion of the internship for the evaluation and grading of the internship course. The total credits for independent studies including MS thesis, projects, reading, and internship cannot exceed 9 credits within the 30 credits towards the MS degree. Note that CP-GY 9911 and CP-GY 9921 can be counted towards the ECE-GY course requirement. However, if a student has already taken more than 7.5 credits of independent studies, he/she will not be approved for another CP course.

Transfer Credits:

No transfer credits are accepted towards the MS degree.

GPA Requirements:

An overall GPA of 3.0 or above in all graduate courses taken at NYU is required. In addition, an average of 3.0 is required among the two core courses.

Graduate Manual

For more information, please refer to the graduate manual, which can be found on the student resources page: https://engineering.nyu.edu/academics/departments/electrical-and-computer-engineering/student-resources

Computer Science, M.S.

Master's Degree Requirements

To satisfy the requirements for the master's degree, the student must complete 30 credits, as described below, with an overall average of B. In addition, a B average is required across the required algorithms course and the four core courses, and a grade of B or better is required for the capstone course, as indicated below. The master's curriculum has four components: 3 credits of algorithms, 12 credits of core elective courses (one of which may also count as the capstone course), one 3 credit capstone course, and 12 credits of general elective courses.

Required Course in Algorithms

Students are required to take CS-GY 6033 Design and Analysis of Algorithms I or CS-GY 6043 Design and Analysis of Algorithms II. Most students will take the Algorithms I course to satisfy the algorithms course requirement. Advanced students who have taken an equivalent Algorithms I course before with a grade of B or better will have the option of taking the Algorithms II course to satisfy the requirement.

Core Course Requirements

Students must take at least four courses from the list of core courses below. The list will be periodically updated by the CSE Department and certain courses may be substituted with departmental consent.

- CS-GY 6063 Software Engineering *3 Credits*
- CS-GY 6083 Principles of Database Systems *3 Credits*
- CS-GY 6133 Computer Architecture I *3 Credits*
- CS-GY 6233 Introduction to Operating Systems *3 Credits*
- CS-GY 6313 Information Visualization *3 Credits*
- CS-GY 6373 Programming Languages *3 Credits*

- CS-GY 6533 Interactive Computer Graphics *3 Credits*
- CS-GY 6613 Artificial Intelligence I *3 Credits*
- CS-GY 6643 Computer Vision *3 Credits*
- CS-GY 6813 Information, Security and Privacy *3 Credits*
- CS-GY 6843 Computer Networking *3 Credits*
- CS-GY 6923 Machine Learning *3 Credits*
- CS-GY 9223 Selected Topics in Computer Science *3 Credits*

Capstone Course Requirement

Certain courses in our department will be designated as capstone courses. Capstone courses are drawn from key technical areas in the MS program and they involve a substantial amount of programming effort. Students are required to take at least one capstone course with a grade of B or better. The list of capstone courses will be posted by the department and will be updated from time to time. If a course is listed both as a capstone course and as a core course, the course can be used to satisfy both the capstone and core course requirements. An MS thesis can also be used to satisfy the capstone course requirement.

Capstone Courses

Here is the approved list of capstone courses:

- CS-GY 6053 Foundation of Data Science *3 Credits*
- CS-GY 6063 Software Engineering *3 Credits*
- CS-GY 6073 Software Engineering II *3 Credits*
- CS-GY 6243 Operating Systems II *3 Credits*
- CS-GY 6253 Distributed Operating Systems *3 Credits*
- CS-GY 6413 Compiler Design and Construction *3 Credits*
- CS-GY 6513 Big Data *3 Credits*
- CS-GY 6533 Interactive Computer Graphics *3 Credits*
- CS-GY 6573 Penetration Testing and Vulnerability Analysis *3 Credits*
- CS-GY 6613 Artificial Intelligence I *3 Credits*
- CS-GY 6643 Computer Vision *3 Credits*
- CS-GY 6673 Neural Network Computing *3 Credits*
- CS-GY 6823 Network Security *3 Credits*
- CS-GY 6943 Artificial Intelligence for Games *3 Credits*
- CS-GY 9163 Application Security *3 Credits*

General Elective Requirements

In addition to the core electives, students are required to take four general elective courses with considerable flexibility; the only restriction is that no more than two of the courses may be taken from outside the Department of Computer Science and Engineering. In particular:

- Master's thesis (6 credits) and/or independent study courses may be part of a student's elective courses. Note that the master's thesis (CS-GY 997X) has an important requirement, as described here.
- Any of the courses in the 13 core areas may be chosen as electives.
- Graduate-level courses from outside of the department (at most two) may be chosen as electives.
- Any CS graduate course not included in the core areas may be chosen as electives.

These courses include (among others):

This list may be updated from time to time based on the current offerings of the department.

- CS-GY 6003 Foundations of Computer Science *3 Credits*
- CS-GY 6033 Design and Analysis of Algorithms I *3 Credits*
- CS-GY 6043 Design and Analysis of Algorithms II *3 Credits*
- CS-GY 6063 Software Engineering *3 Credits*
- CS-GY 6073 Software Engineering II *3 Credits*
- CS-GY 6083 Principles of Database Systems *3 Credits*
- CS-GY 6093 Advanced Database Systems *3 Credits*
- CS-GY 6133 Computer Architecture I *3 Credits*
- CS-GY 6143 Computer Architecture II *3 Credits*
- CS-GY 6233 Introduction to Operating Systems *3 Credits*
- CS-GY 6243 Operating Systems II *3 Credits*
- CS-GY 6253 Distributed Operating Systems *3 Credits*
- CS-GY 6273 Performance Evaluation of Computer Systems *3 Credits*
- CS-GY 6313 Information Visualization *3 Credits*
- CS-GY 6323 Large-Scale Visual Analytics *3 Credits*
- CS-GY 6373 Programming Languages *3 Credits*
- CS-GY 6413 Compiler Design and Construction *3 Credits*
- CS-GY 6533 Interactive Computer Graphics *3 Credits*
- CS-GY 6543 Human Computer Interaction *3 Credits*
- CS-GY 6553 Game Design *3 Credits*
- CS-GY 6613 Artificial Intelligence I *3 Credits*
- CS-GY 6643 Computer Vision *3 Credits*
- CS-GY 6673 Neural Network Computing *3 Credits*
- CS-GY 6703 Computational Geometry *3 Credits*
- CS-GY 6753 Theory of Computation *3 Credits*
- CS-GY 6813 Information, Security and Privacy *3 Credits*
- CS-GY 6823 Network Security *3 Credits*
- CS-GY 6843 Computer Networking *3 Credits*
- CS-GY 6903 Applied Cryptography *3 Credits*
- CS-GY 6913 Web Search Engines *3 Credits*
- CS-GY 6923 Machine Learning *3 Credits*
- CS-GY 6963 Digital Forensics *3 Credits*
- CS-GY 9033 Web Services and SOA *3 Credits*
- CS-GY 9053 Introduction to Java *3 Credits*
- CS-GY 9093 Biometrics *3 Credits*
- CS-GY 9103 Object Oriented Design with Java *3 Credits*
- CS-GY 9133 Emerging Technology for IP *3 Credits*
- CS-GY 9163 Application Security *3 Credits*
- CS-GY 9223 Selected Topics in Computer Science *3 Credits*

Preparatory Course

The Bridge to NYU Tandon Program is a prerequisite course recommended to those interested in applying for the Computer Science Master's Degree who are lacking a background in computer science, mathematics, science, or engineering.

If you have a degree in liberal arts or similar, our one-course online program will provide you the tools needed to upgrade your computer science knowledge for consideration to a qualifying master's degree at the School of Engineering. Should you complete this intensive bridge course with a grade of B+ or better, you are eligible to be admitted without any course deficiencies, should you meet all other School of Engineering admission requirements.

Learn more: Computer Science Bridge Program

Construction Management, M.S.

Curriculum

A minimum of 15 credits (5 courses) must be selected from the following courses:

- CE-GY 7963 Selected Topics in Construction I *3 Credits*
- CE-GY 7973 Selected Topics in Construction II *3 Credits*
- CE-GY 8243 Construction Modeling Techniques *3 Credits*
- CE-GY 8253 Project Management for Construction *3 Credits*
- CE-GY 8263 Construction Cost Estimating *3 Credits*
- CE-GY 8273 Contracts and Specifications *3 Credits*
- CE-GY 8283 Risk Analysis *3 Credits*
- CE-GY 8293 Construction Operations Analysis *3 Credits*
- CE-GY 8303 Information Systems in Project Management *3 Credits*
- CE-GY 8313 Engineering for Construction I: Methods and Technologies *3 Credits*
- CE-GY 8323 Engineering for Construction II: Design *3 Credits*
- CE-GY 8333 Marketing for Construction Management and Engineering Services *3 Credits*
- CE-GY 8343 Construction Site Safety *3 Credits*
- CE-GY 8353 Construction Scheduling *3 Credits*
- CE-GY 8363 Building Information Modeling Project Controls *3 Credits*
- CE-GY 8373 Construction Accounting and Finance *3 Credits*
- CE-GY 8383 Building Information Modeling (BIM) and Its Applications in AEC/FM *3 Credits*
- MG-GY 8203 Project Management *3 Credits*
- MG-GY 6013 Organizational Behavior *3 Credits*
  The following Exec21 Core Courses may be applied to the above Major Requirement by a student who is enrolled in or has completed the Exec21 Program, or by any other student with consent of a Construction Management Program Director.
- CE 8703 Managing and Leading in the 21st Century *3 Credits*
- CE 8713 Construction and the Law *3 Credits*
- CE 8723 How to Succeed in Construction *3 Credits*
- CE 8733 Infrastructure Financing: Structuring of a Deal *3 Credits*
- CE 875X Employer Focused Residency *Up to 3 credits Credits*
- CE 8763 Capital Program Management/Program Development *3 Credits*
- CE 8773 Dispute Avoidance and Resolution *3 Credits*
- CE 8783 Construction Management and Planning *3 Credits*
- CE 8803 Infrastructure Planning for Public Works *3 Credits*

Note:

The above list is subject to change as courses are added to, or deleted from the Program.

All students must complete a minor concentration of study, which shall consist of a minimum of 6 credits (two courses), and not more than 9 credits (three courses), selected from courses in any single graduate academic program at NYU Tandon School of Engineering, or any other concentrated area of study approved by a Construction Management Program Director. The selection of the minor concentration of study shall be made with the advisement and consent of a Construction Management Program Director.

Students entering the program **prior to Spring 2019** may complete an up to three (3)-credit independent project to satisfy the Major Requirement: CE-GY 9963 MS Project in Civil & Urban Engineering. Each student entering the program in **Spring 2019 onward** MUST complete either: (a) CE-GY 8393 Leadership, Ethics, and Project Execution; (b) CE-GY 9963 MS Project in Civil & Urban Engineering; or (c) another approved capstone course. A student shall not enroll in such course until after such student has completed eighteen (18) credits, or such student is in the final semester of enrollment in the program, whichever is sooner.

The remaining courses needed to fulfill the 30-credit requirement shall be selected from the Civil Engineering, Transportation or Construction Management Programs (bearing a CE-GY xxxx or TR-GY xxxx designation), unless otherwise authorized by a Construction Management Program Director. However, if the minor area of study is from the Civil and Urban Engineering Department, up to two of the remaining courses may be selected from any other electives at NYU Tandon School of Engineering.

Note that some electives include prerequisites that not all program enrollees may have completed. Students cannot register for a course for which they have not satisfied the stated prerequisites unless they have the written permission of both the course instructor and a Construction Management Program Director.

Grade Requirements

To earn a Master of Science in Construction Management, students must maintain a B (3.0) cumulative average in all graduate courses taken at NYU Tandon School of Engineering.

Cybersecurity (Online), M.S.

Cybersecurity

As the demand for skilled information-security professionals continues to grow, computer and network professionals now can turn to this online, in-demand master's to emerge as sophisticated practitioners in cybersecurity, the science of protecting vital computer networks and electronic infrastructures from attack. Students acquire a solid foundation in key technologies-computer and network security, digital forensics, cryptography and biometrics. They study with internationally recognized faculty from the Information Systems and Internet Security (ISIS) Laboratory. With industry continuing to place top priority on safeguarding its data and information systems, students become well prepared for careers in developing security products, as security-application programmers, security analysts, penetration testers, vulnerability analysts and security architects.

Required Computer Science Courses: 3 Credits each

- CS-GY 6033 Design and Analysis of Algorithms I *3 Credits*
- CS-GY 6233 Introduction to Operating Systems *3 Credits*
- CS-GY 6843 Computer Networking *3 Credits*

Required Security Core Courses: 3 Credits each

- CS-GY 6813 Information, Security and Privacy *3 Credits*
- CS-GY 6823 Network Security *3 Credits*
- CS-GY 6903 Applied Cryptography *3 Credits*
- CS-GY 9163 Application Security *3 Credits*

Select Any 3 Electives: 3 Credits each

- CS-GY 6573 Penetration Testing and Vulnerability Analysis *3 Credits*
- CS-GY 6803 Information Systems Security Engineering and Management *3 Credits*
- CS-GY 9093 Biometrics *3 Credits*
- CS-GY 6963 Digital Forensics *3 Credits*
- CS-GY 9963 Advanced Project in Computer Science *3 Credits* (in the area of cybersecurity)
- CS-GY 6243 Operating Systems II *3 Credits*
- CS-GY 6043 Design and Analysis of Algorithms II *3 Credits*
- CS-GY 6133 Computer Architecture I *3 Credits*
- **Research Project (Optional)**
- **Master's Thesis (Optional)**

Minimum Total: 30 Credits

Cybersecurity Risk and Strategy, M.S. (Offered jointly by the NYU School of Law and NYU Tandon School of Engineering)

Link: https://cybersecurity-strategy-masters.nyu.edu/mscrs-program-overview/

Program Overview

Overview

Offered jointly by NYU School of Law and NYU Tandon School of Engineering, the MS in Cybersecurity Risk and Strategy is a one-year program intended for experienced professionals from a range of backgrounds who seek to deepen their understanding of cybersecurity risk and strategy. Cybersecurity-both prevention and response-frequently requires coordination between public- and private-sector organizations and expertise in technology, law, and policy. This program will create managers with the integrated expertise needed to play a leadership role in the field.

Program Format

The MS in Cybersecurity Risk and Strategy program is a 30-credit MS management degree for professionals, incorporating both online courses and blended-learning modules. Over a 12-month period, participants will participate in three one week residential sessions,*
along with two days for Capstone Presentations and Graduation in May 2022. Between residential periods, students will study 10-15 hours per week in online and blended-learning formats. Semesters are divided into three phases: online introduction, in-class residency,* and

online implementation. Spanning all three semesters is the "Integrative Cybersecurity Management" capstone, a team-based project.

Program Length

1 Year

Program Start

May 2021

Residency Format

The three in-person sessions* will take place over the course of one week of on-campus instruction and will be held in the Summer Semester, Fall Semester, and Spring Semester.

In addition to the online pre-program courses, students will be responsible for completing readings and online seminars between each in-person session.*

Residency Dates

Dates for Class of 2022:

1. June 14-19, 2021
2. October 18-23, 2021
3. March 14-19, 2022
4. Capstone presentations and Graduation: May 2022 (Capstone presentation date TBD)

Language

All classes are instructed in English.

Fee

The program fee for the Class of 2022 is US $85,500. This fee includes tuition, course materials, and official events. Hotel and travel expenses are not included.*

A **non-refundable tuition pre-payment of $600 USD** is required to secure a spot in the Class of 2022 and begin the pre-program coursework.

The **program fee** will be paid in installments of:

1. **$27,900** for the Summer 2021 semester
2. **$28,500** for the Fall 2021 semester
3. **$28,500** for the Spring 2022 semester

Capstone Project

Spanning all three semesters is the "Integrative Cybersecurity Management" capstone, a team-based project that will allow students to demonstrate their ability to take an integrated view of cybersecurity risk and strategy. Working in groups, students will tackle difficult challenges of technology, law, risk, and strategy.

As students refine their projects, teams will meet and discuss issues related to the capstone with the Faculty Directors (and other faculty members or industry mentors, as appropriate). By the end of the degree program students will be required to present final projects designed to solve specific operational cybersecurity challenges from an interdisciplinary perspective.

Learn More: Cybersecurity Risk and Strategy (https://cybersecurity-strategy-masters.nyu.edu/mscrs-program-overview)

*Due to COVID-19 and resulting travel restrictions, future in-person residencies may be converted to remote instruction. We will share more information as it becomes available.

Cybersecurity, M.S.

Master's Degree Requirements

Core Electives and Requirements

To satisfy the requirements for the Cybersecurity MS program, the student must complete 30 credits, as listed below, with an overall average of B. In addition, a B average is required across all the required core courses, as indicated below.

Computer Science Core Courses

- CS-GY 6233 Introduction to Operating Systems *3 Credits*
- CS-GY 6843 Computer Networking *3 Credits*
- CS-GY 6033 Design and Analysis of Algorithms I *3 Credits*

Security Core Courses

Most of the required Security Core courses have a project component.

- CS-GY 6813 Information, Security and Privacy *3 Credits*
- CS-GY 6823 Network Security *3 Credits*
- CS-GY 6903 Applied Cryptography *3 Credits*
- CS-GY 9163 Application Security *3 Credits*

Electives (3 courses)

Students may choose security-related courses from the NYU Tandon School of Engineering or from other schools of New York University, including courses in the psychology, law and sociology departments. Selected courses must be approved by the Program Committee. All of the following courses are preapproved; others must be approved by the Program Committee.

- CS-GY 6573 Penetration Testing and Vulnerability Analysis *3 Credits*
- CS-GY 6803 Information Systems Security Engineering and Management *3 Credits*
- CS-GY 9093 Biometrics *3 Credits*
- CS-GY 6963 Digital Forensics *3 Credits*
- CS-GY 9963 Advanced Project in Computer Science *3 Credits*
- CS-GY 6043 Design and Analysis of Algorithms II *3 Credits*
- CS-GY 6133 Computer Architecture I *3 Credits*
- CS-GY 6003 Foundations of Computer Science *3 Credits*

Footnotes

* Any required Computer Science core courses may be replaced if the student has taken a similar class.

Research Project (Optional)

One goal of the MS in Cybersecurity is to introduce students to exciting research in cybersecurity and to attract some of them to pursue a PhD degree. To this end, NYU Tandon Online offers a semester-long Advanced Project in Computer Science (CS-GY 9963) in cybersecurity (as listed above), as an elective. Students selecting this option are guided by a research professor and gain invaluable research experience.

Preparatory Courses

We offer 3 preparatory bridge courses for students who do not have a working knowledge of a high level, general-purpose programming language or a background in sets, functions, relations, asymptotic notation, proof techniques, induction, combinatorics, discrete probability, recurrences, graphs, trees, mathematical models of computation and undecidability.

- CS-GY 5303 Introduction to Programming and Problem Solving *3 Credits*
- CS-GY 5403 Data Structures and Algorithms *3 Credits*
- CS-GY 6003 Foundations of Computer Science *3 Credits*

Master's Thesis (optional)

In addition to the above semester-long, research experience for students, the program also offers research-oriented MS students the master's thesis option. With this option, a student takes 6 credits of CS-GY 997X MS Thesis in Computer Science working with a faculty adviser on a research problem in cybersecurity, in lieu of two out of the three required electives.

The research need not be original, but should demonstrate adequately the student's proficiency in the subject. An oral defense of the master's thesis before at least three professors is required. The 6 credits of master's thesis must span two consecutive semesters. Whenever relevant, 3 credits of CS-GY 9963 may be used as 3 credits of CS-GY 997X, subject to faculty-adviser approval.

Cyber Ops Specialization

National Centers of Academic Excellence in Cyber Operations Program:

NYU Tandon School of Engineering is one of about 20 graduate schools in the country to have the designation of National Centers of Academic Excellence (CAE) in Cyber Operations. The CAE-Cyber Operations program is intended to be a deeply technical, interdisciplinary, higher education program firmly grounded in the computer science (CS), computer engineering (CE), and/or electrical engineering (EE) disciplines, with extensive opportunities for hands-on applications via labs/exercises.

National Centers of Academic Excellence - Cyber Operations

Courses:

Students who wish to receive an acknowledgment that they have completed the NSA Cyber Operation Program must successfully complete the following courses:

3 Credits **Design and Analysis of Algorithms I** CS-GY6033

3 Credits **Introduction to Operating Systems** CS-GY6233

3 Credits **Penetration Testing and Vulnerability Analysis**CS-GY6573

3 Credits **Information Systems Security Engineering and Management** CS-GY6803

3 Credits **Information, Security and Privacy** CS-GY6813

3 Credits **Network Security** CS-GY6823

3 Credits **Computer Networking** CS-GY6843

3 Credits **Applied Cryptography** CS-GY6903

3 Credits **Application Security** CS-GY9163

The CAE in Cyber Operations Summer Program (CAE-Cyber Ops SP) is the National Security Agency's (NSA) premier outreach program for students enrolled in the Cyber Operations specialization at NSA-designated universities. Selectees will be invited to participate in a 12-week summer program to gain knowledge of specific cyber-related topics and apply educational knowledge to address various real-world mission-related technical challenges. Participants in the program will work on a broad range of problems involving applications of computer science and engineering.

CAE in Cyber Operations Summer Intern Program

Preparatory Course

Bridge to NYU Tandon:

The Bridge to NYU Tandon Program is a prerequisite course recommended to those interested in applying for the Cybersecurity Master's Degree who are lacking a background in science or engineering.

If you have a degree in liberal arts or similar, our one-course online program will provide you the tools needed to upgrade your math, science or engineering knowledge for consideration to a qualifying master's degree at the School of Engineering. Should you complete this intensive bridge course with a grade of B+ or better, you are eligible to be admitted without any course deficiencies, should you meet all other School of Engineering admission requirements.

Learn More: Cybersecurity Bridge Program

Electrical Engineering, M.S.

Requirements for the Master of Science

Entrance Requirements

Admission to the Master of Science in Electrical Engineering Program requires a Bachelor's in Electrical and/or Computer Engineering from an accredited institution, with a GPA of 3.0/4.0 or higher. The Graduate Record Exam (GRE) is required for all applicants. Students who do not have a prior BS degree in Electrical and/or Computer Engineering but have strong background in their chosen focus areas of study and sufficient mathematics preparation may be considered for admission.

Course Requirements

To obtain the MS degree in Electrical Engineering, students must complete a total of 30 credits, with restrictions described below.

Degree Requirements

Core Courses:

The core courses cover fundamental material and should be taken as early as possible. An advanced course subsequent to a core course may be taken in lieu of the core course, upon approval by the MSEE program advisor. All students must choose two out of the following core courses:

- ECE-GY 6113 Digital Signal Processing I *3 Credits*
- ECE-GY 6253 Linear Systems *3 Credits*
- ECE-GY 6303 Probability and Stochastic Processes *3 Credits*
- ECE-GY 6713 Electromagnetic Theory and Applications *3 Credits*
- ECE-GY 6403 Fundamentals of Analog Integrated Circuit Design *3 Credits*

Concentration Areas:

Students are recommended to select courses to focus on one or two concentration areas, to obtain sufficient depth in the chosen areas. To provide flexibility for course selection based on the student's interests, a student does not need to officially declare a concentration, and no specific number of credits is required for each chosen centration. For an up-to-date list of concentration areas and courses for each area, please visit: http://archive.engineering.nyu.edu/academics/departments/electrical

Thesis, project, reading:

Students are encouraged to participate in research by registering for a master's thesis (ECE-GY 997x, 6 credits, can be taken over two semesters), an advanced project (ECE-GY 9953 or ECE-GY 9963, 3 credits each, ECE-GY 9941, 1.5 credits) or a reading course (ECE-GY 9933, 3 credits). Students must secure a faculty member's commitment for advising such individual studies. Oral defense of the master's thesis with at least three professors (at least 2 ECE professors) in attendance is required. For the project and reading courses, a project report and an oral presentation is required. The total credits for thesis, projects, readings, and internships (see below) should not exceed 9 credits within the 30 credits required for the MS degree.

Internships:

International students must register for an internship course (CP-GY 9911, CP-GY 9921, 1.5 credit each) to do an internship. Up to 3 credits of approved internships can be applied towards the 30 credits MS degree requirement. International students cannot do internship after they have completed the degree requirement. For an internship to be approved for credits, the internship job must provide industry and/or research experience relevant to the Electrical Engineering degree program. All internships must be approved and supervised by an ECE faculty member. Students must secure a faculty member's commitment for advising an internship. The internship supervisor should submit a midterm and a final term evaluation report to the advisor. The student must submit a project report to the faculty advisor upon completion of the internship for the evaluation and grading of the internship course. The total credits for independent studies including MS thesis, projects, reading, and internship cannot exceed 9 credits within the 30 credits towards the MS degree. Note that CP-GY 9911 and CP-GY 9921 can be counted towards the ECE-GY course requirement. However, if a student has already taken more than 7.5 credits of independent studies, he/she will not be approved for another CP course.

Out-of-department courses and 5000-level ECE courses:

At least 24 credits should be ECE-prefixed courses. The other 6 credits can be from any science, engineering or management departments. A 3-credit course taken at other science or engineering departments of NYU that is closely related to electrical engineering may be used to substitute an ECE-GY course upon approval by the MSEE program advisor. The total number of credits for 5000-level ECE courses and non-ECE courses cannot exceed 12 credits. (Note that CS-GY 6133 Computer Architecture I taken before Fall 17 will be counted as ECE-GY credits for this purpose.) Credits from 5000-level courses from other departments cannot be counted towards MS/EE degree, except with approval by the Program Director.

Note about CS-GY 6843 Computer Networking:

We expect most students have covered this material in an undergraduate course. Therefore, students can only take this course for credits towards MSEE degree in exceptional cases and only if approved by Professor Yong Liu.

Transfer Credits:

No transfer credits are accepted towards the MS degree.

GPA requirements:

An overall GPA of 3.0 or above in all graduate courses taken at NYU is required. In addition, an average of 3.0 is required among the two core courses.

Graduate Manual

For more information, please refer to the graduate manual, which can be found on the student resources page: https://engineering.nyu.edu/academics/departments/electrical-and-computer-engineering/student-resources

Environmental Engineering, M.S.

Goals and Objectives

The MS in Environmental Engineering prepares graduates to plan, functionally design, control, operate and manage municipal and industrial pollution-prevention systems. Students are exposed to a learning atmosphere that provides a mix of theoretical and practical approaches. Courses include a mix of presentations, project exercises and practical problem solutions.

Specific program objectives are to provide the skills necessary to:

- fundamentally understand the science and engineering of natural and man-made environmental systems;
- functionally design air, water and waste treatment systems and components;
- control and operate environmental facilities;
- understand the modeling and simulation of environmental systems; and
- participate actively in multidisciplinary teams to solve environmental problems.

Program Requirements

Core Courses: 12 Credits

- CE-GY 7373 Environmental Chemistry and Microbiology *3 Credits*
- CE-GY 7423 Water and Wastewater Treatment *3 Credits*

and select 2 of the following 4 courses:

- CE-GY 7223 Hydrology *3 Credits*
- CE-GY 7233 Groundwater Hydrology and Pollution *3 Credits*
- CE-GY 7753 Environmental Systems Management *3 Credits*
- CE-GY 7673 Environmental Impact Assessment *3 Credits*

Major Courses: Minimum of 9 Credits

Select 3 of the following (minimum):

- CE-GY 7393 Advanced Environmental Chemistry and Microbiology *3 Credits*
- CE-GY 7433 Advanced Water and Wastewater Treatment *3 Credits*
- CE-GY 7473 Modeling Fate and Transport of Surface Water Pollution *3 Credits*
- CE-GY 8493 Environmental Geotechnology *3 Credits*
- CE-GY 7703 Solid Waste Management *3 Credits*
- CE-GY 7523 Air Pollution *3 Credits*
- CE-GY 7573 Detection and Control of Waterborne Pathogens *3 Credits*
- CE-GY 8283 Risk Analysis *3 Credits*
- CE-GY 7723 Selected Topics in Environmental and Water Resources Eng I *3 Credits* - Geomatics & GIS In Civil and Env Eng.
- CE-GY 7353 Selected Topics in Water Resources and Hydraulic Engineering I *3 Credits* - Design of Wetlands
- CE-GY 7363 Selected Topics in Water Resources and Hydraulic Engineering II *3 Credits*
- CE-GY 7653 Wetland Design for Water Quality Improvement *3 Credits*
- CE-GY 7713 Selected Topics in Environmental and Water Resources Eng *3 Credits*
- CE-GY 7733 Geomatics and GIS Application in Civil and Environmental Engineering *3 Credits*

Optional Master Project or Thesis: 3-6 Credits

Students may opt to take additional approved engineering and science electives rather than complete a MS project or thesis for their degree.

- CE-GY 9963 MS Project in Civil & Urban Engineering *3 Credits*
- CE-GY 997X Thesis for MS in Civil Engineering *3-6 Credits*

Electives: 3-6 Credits

3-6 credits of approved engineering and science electives

Total: 30 Credits

Environmental Science, M.S.

Goals and Objectives

The primary goal of the MS in Environmental Science is to prepare professionals to:

- fundamentally understand the science and applied engineering of natural and manmade environmental systems;
- evaluate the interactions between man and the environment and control adverse impacts of pollution on ecological systems;
- understand the monitoring and laboratory analysis of environmental systems; and
- participate actively in a multidisciplinary team of professionals to solve environmental problems.

Program Requirements

1. Core Courses: 9 Credits

- CE-GY 7373 Environmental Chemistry and Microbiology *3 Credits*
- CE-GY 7423 Water and Wastewater Treatment *3 Credits*
- CE-GY 7223 Hydrology *3 Credits*

2. Twelve credits of approved courses

Courses may be taken in Environmental Engineering, Chemical and Biological Engineering at NYU Tandon, and NYU Environmental Health Science, including up to 6 approved transfer credits.

Suggested Approved Courses:

- CE-GY 7233 Groundwater Hydrology and Pollution *3 Credits*
- CE-GY 7393 Advanced Environmental Chemistry and Microbiology *3 Credits*
- CE-GY 7433 Advanced Water and Wastewater Treatment *3 Credits*
- CE-GY 7473 Modeling Fate and Transport of Surface Water Pollution *3 Credits*
- CE-GY 7523 Air Pollution *3 Credits*

- CE-GY 7553 Environmental Toxicology *3 Credits*
- CE-GY 7573 Detection and Control of Waterborne Pathogens *3 Credits*
- CE-GY 7673 Environmental Impact Assessment *3 Credits*
- CE-GY 7703 Solid Waste Management *3 Credits*
- CE-GY 7753 Environmental Systems Management *3 Credits*
- CE-GY 9963 MS Project in Civil & Urban Engineering *3 Credits*
- CE-GY 997X MS Thesis in Civil & Urban Engineering Department *6 Credits*
- CE-GY 7353 Selected Topics in Water Resources and Hydraulic Engineering I *3 Credits* - Design of Wetlands
- CE-GY 7723 Selected Topics in Environmental and Water Resources Eng I *3 Credits* - Geomatics & GIS In Civil and Env Eng.
- BIOL-GA 1004 Environmental Health (NYU CAS) *3 Credits*
- EHSC-GA 1010 Weather, Air pollution and Health (NYU CAS) *3 Credits*
- EHSC-GA.1006 Toxicology (NYU CAS) *3 Credits*
- CE-GY 6053 Monitoring Cities *3 Credits*
- CE-GY 7363 Selected Topics in Water Resources and Hydraulic Engineering II *3 Credits*
- CE-GY 7653 Wetland Design for Water Quality Improvement *3 Credits*
- CE-GY 7713 Selected Topics in Environmental and Water Resources Eng *3 Credits*
- CE-GY 7733 Geomatics and GIS Application in Civil and Environmental Engineering *3 Credits*

3. Nine credits of approved elective courses

Total: 30 Credits

Financial Engineering, M.S.

The Master of Science Program

The Master of Science in Financial Engineering (FE) is a 33-credit program designed to provide students with the skills required to operate at the cutting-edge of financial engineering in today's financial services industry. The program is rigorous, demanding and selective. The MS in Financial Engineering is a well-established program with a diverse curriculum. Our faculty are recognized leaders in their fields, all with extensive practical expertise. They produce world-class research while teaching both introductory and advanced courses in small class settings. The financial and practical components of the educational program have been further strengthened by developing a large and versatile body of adjunct faculty consisting of leading financial market practitioners from major Wall Street firms as well as international affiliated faculty. These adjunct faculty members work closely with full-time faculty emphasizing both applied and theoretical research in bringing to financial engineering students a greater sensitivity to the needs and the demands of financial markets and the management of financial services and institutions.

Required to Complete the Financial Engineering MS program

- Two pre-program boot camp courses (0 credits)
- Self-paced course in the use of Bloomberg Terminals (0 credits)
- Core courses (15 credits):
    - Required courses:
        - FRE-GY 6073 Introduction to Derivative Securities (3 credits)
        - FRE-GY 6083 Quantitative Methods in Finance (3 credits)
        - FRE-GY 6103 Valuation for Financial Engineering (3 credits)

    - Two of the following three courses:
        - FRE-GY 6023 Financial Economics (3 credits)
        - FRE-GY 6123 Financial Risk Management (3 credits)
        - FRE-GY 7773 Machine Learning in Financial Engineering (3 credits)
- Elective coursework (13.5 credits)
- Laboratory learning (1.5 credits)
- Capstone (3 credits)
- Capstone assessment course (0 credits)
- **Total # of credits: 33**

The program prepares its graduates to enter fast-moving, highly rewarding careers spanning the many occupations prevalent in financial services and related industries. The educational program is continuously updated and adapted to the changing financial environment.

Admissions

The Department receives a large number of applications every year. To be considered for admission into the MS in Financial Engineering program, students must have a Bachelor's Degree from an accredited institution and proven mathematical mastery of the following topics:

- Linear Algebra
- Probability Theory
- Multi-variable Calculus
- Applied Statistics
- Computer Programming

Applicants must submit official transcripts from each institution attended as well as GRE test scores. When applicable, applicants must also prove English language proficiency demonstrated by a TOEFL or IELTS score.

The FRE department does not accept change-of- major requests from students in other NYU programs. In all instances, students must formally apply to this MS FE program. Applicants must have demonstrated proficiency in the mathematical areas listed to be considered for admission.

For questions about the application process, application status or to talk to an admissions counselor, please contact:

Office of Graduate Enrollment Management and Admissions

NYU Tandon School of Engineering
Six MetroTech Center
Brooklyn, NY 11201
engineering.gradinfo@nyu.edu
Phone: 646.997.3182
Fax: 646.997.3624

Industrial Engineering (Online), M.S.

Description

Industrial engineers are key professionals who explore how industrial systems work and spearhead effective and efficient delivery of quality products and services. In this online Master of Science in Industrial Engineering, students learn to exploit analytic modeling, system simulation, queuing systems, work design, project planning, facilities design and quality management and control, practices that are fast becoming essential in global industry.

Required Core Courses: 12 Credits

- IE-GY 6113 Quality Control and Improvement *3 Credits*
- IE-GY 6213 Facility Planning and Design *3 Credits*
- IE-GY 6823 Factory Simulation *3 Credits*
- MN-GY 7893 Production Science *3 Credits*

Additional Requirements

- 9 Credits with Either IE or MN Designation
- Elective 9 credits (course selection optional)

Minimum Total: 30 Credits

Industrial Engineering, M.S.

Requirements for the Master of Science

The general requirements for the degree Master of Science are stated in this catalog under "Graduate Degrees". Detailed requirements for this degree are shown below.

Admission to the Master of Science program requires a bachelor's degree in a related discipline from an accredited institution. Applicants should have a superior undergraduate academic record. Students who do not meet these requirements are considered individually for admission and may be admitted subject to their completion of courses to remove deficiencies. Students are encouraged to seek waivers (and have approved substitutes designated) for all required courses in which they can demonstrate competence, thereby using their time effectively.

Prerequisite Courses (or equivalent knowledge)

Students must have knowledge of engineering economics and probability and statistics. Prospective students lacking the relevant knowledge may satisfy the requirement by taking probability and statistics (MA-GY 6513 or equivalent).

Up to 3 credits of graduate courses in this category of prerequisite knowledge can be counted toward the degree as electives, although the electives needed for the student’s concentration also must be satisfied.

Required Core Courses: 12 Credits

- IE-GY 6113 Quality Control and Improvement *3 Credits*
- IE-GY 6213 Facility Planning and Design *3 Credits*
- IE-GY 6823 Factory Simulation *3 Credits*
- MN-GY 7893 Production Science *3 Credits*

Other Courses: 18 Credits

Students must take three electives from manufacturing or industrial engineering for a total of 9 credits.

The following courses can be used to fulfill the elective requirements for the Masters in Industrial (IE) engineering. Students can also elect to take an additional three courses/nine credits outside of the MN/IE curriculum with approval from their academic advisor.

- MG-GY 6103 Management Science *3 Credits*
- MG-GY 6303 Operations Management *3 Credits*
- MG-GY 8203 Project Management *3 Credits*
- MG-GY 6343 Human Capital Engineering & Analytics *3 Credits*
- MG-GY 6361 Managing Business Process Reengineering *1.5 Credits*
- MG-GY 8643 New Product Development *3 Credits*
- MG-GY 8653 Managing Technological Change and Innovation *3 Credits*
- MG-GY 9753 Business Analytics *3 Credits*
- MG-GY 9753 Quality Management/Six Sigma *3 Credits*

Total: 30 Credits

Note:

Students should elect other courses in consultation with their adviser. Concentrations in areas suited to students' career interest are encouraged (e.g., manufacturing, mechanical engineering, operations management, construction management and management of technology). Courses from computer science or management may supplement such a concentration.

Integrated Digital Media, M.S.

Degree Requirements for the Master of Science

Students must complete 30 credits in a minimum of three semesters, but no more than ten to obtain a Master of Science in Integrated Digital Media. Students typically take a four course load (3 credits per course) in the fall and spring of their first year. Students must enroll in MS Pre-Thesis and MS Thesis in their final two consecutive semesters (not simultaneously). Below is the distribution of credit requirements.

Typical Course of Study for the Master of Science in Integrated Digital Media (POSSIBLE OUTLINE)

IDM admits starting their degree in the Fall semester will start in-person/on campus.

First Semester, Fall

- DM-GY 6053 Ideation & Prototyping *3 Credits*
- DM-GY 6063 Creative Coding *3 Credits*
  Elective
- DM-GY 9990 Graduate Colloquium *0 Credits*

Second Semester, Spring

- DM-GY 6043 Theories and Cultural Impact of Media & Technology *3 Credits*
  Elective
  Elective
- DM-GY 9990 Graduate Colloquium *0 Credits*

Third Semester, Fall

- DM-GY 7033 Media Law *3 Credits*
- DM-GY 9990 Graduate Colloquium *0 Credits*
- DM-GY 9963 MS Pre-Thesis in Digital Media: Research Methods *3 Credits*
  Elective

Fourth Semester, Spring

- DM-GY 997X MS Thesis in Integrated Digital Media *3-6 Credits*
- DM-GY 9990 Graduate Colloquium *0 Credits*

If beginning in a Spring Term (POSSIBLE OUTLINE):

IDM admits starting their degree in the Spring semester will start online.

First Semester, Spring

- DM-GY 6063 Creative Coding *3 Credits*
- DM-GY 6053 Ideation & Prototyping *3 Credits*
- Elective

Second Semester, Fall

- DM-GY 6043 Theories and Cultural Impact of Media & Technology *3 Credits*
  Elective
  Elective

Third Semester, Spring

- DM-GY 7033 Media Law *3 Credits*
- DM-GY 9963 MS Pre-Thesis in Digital Media: Research Methods *3 Credits*
  Elective

Fourth Semester, Fall

- DM-GY 997X MS Thesis in Integrated Digital Media *3-6 Credits*

Management of Technology (Online), M.S.

If you are looking to make a difference in the new digital economy, where bridging the gap between management and technology is crucial, you should enroll in NYU Tandon School of Engineering's online Master's in Management of Technology (MOT). If you are a mid-career manager or member of a technical staff, the program is technology based and industry-driven, allowing you to create and deliver value to your organization.

MOT is your unique path to management, leadership, innovation, entrepreneurship, design thinking, and creativity for 21st century leaders. Encompassing a broad range of industry sectors, the degree is your fast track to high-tech leadership.

Business and Technology Required Core Courses (12 Credits)

- MG-GY 6013 Organizational Behavior *3 Credits*
- MG-GY 6023 Economics & Strategy *3 Credits*
- MG-GY 6033 Financial Analysis for Tech Managers *3 Credits*
- MG-GY 7953 Global Innovation *3 Credits*

Technology Management Tools (9 Credits Required)

Must take **any three** from the following menu:

- MG-GY 6933 Information Technologies, Systems and Management in Organizations *3 Credits*
- MG-GY 6303 Operations Management *3 Credits*
- MG-GY 8203 Project Management *3 Credits*
- MG-GY 6183 Communication for Technology Managers *3 Credits (Business Analytics)*
- MG-GY 6183 Communication for Technology Managers *3 Credits (Communications for Tech Managers)*

Electives (12 Credits)

Can take both 1.5 credits and 3 credits courses totaling up to 12 credits (including internships).

Capstone Experience (3 Credits Required)

Must take **one** of the following:

- MG-GY 9503 MOT Capstone Project Course *3 Credits*
- MG-GY 9703 Project in Strategy and Innovation *3 Credits*
- MG-GY 6183 Communication for Technology Managers *3 Credits*
- MG-GY 997X MS Thesis in Technology Management *3 Credits*

Total Credits Required: 36

Management of Technology, M.S.

Program Description and Purpose

Effective use of technology, leadership, innovation practice and management and entrepreneurship increasingly determine success in business. The Department of Technology Management and Innovation is an acknowledged pioneer and leader in the New York City/tri-state region and beyond in offering courses and programs about these increasingly critical arenas. The department serves a diverse and broad range of professionals, and its faculty and students compose a vital and forward-thinking research and learning community. The department's research and educational offerings focus on a broad range of industry sectors, including financial and professional services; information technology, renewable energy and clean technology as well as non-profits and government-all constituting areas of greatest growth and opportunity in the modern economy, especially in New York City, the nation's foremost global city.

The NYU Tandon School of Engineering Master's Degree Program in Management of Technology (MOT) was created for professionals who aim to make a difference in an economy where connecting the technology and business worlds is crucial. It introduces participants to the latest thinking and best practices in technology management and innovation. For forward-thinking managers, the MOT Program is a proven and unique path to leadership, innovation, entrepreneurship, design thinking, and creativity in the Twenty-First Century.

Program Structure and Curriculum

The MOT Program comprises 12 courses (see listing below) totaling 36 credits. Courses for the MOT program are held on weekday evenings and on Saturdays at 55 Broad Street in Lower Manhattan and on weekday evenings at the Brooklyn campus of the School of Engineering. Fulltime students may complete this MS program in 10 calendar months by completing 4 courses per semester for 3 semesters, or in 15 calendar months by completing 3 courses per semester for 4 semesters. Part-time students may take from one to two courses per semester, completing the program in 22 to 44 calendar months. Participants who complete the MOT Program receive a Master of Science degree in Management of Technology.

For the most current information: https://engineering.nyu.edu/academics/programs/management-technology-ms

The MOT program's series of required courses provide participants with a deep understanding of the foundations of managerial competencies needed to manage innovation in the evolving business environment. In addition, participants can choose electives from the Department of Technology Management and Innovation or from other areas of the School that can enhance their understanding of a particular area of interest in the broadly defined arena of technology management.

Courses

The MS MOT 36-credit curriculum consists of 12 three-credit courses:

- Management Core courses (12 credits)
- Technology Management Tools (9 credits)
- Elective courses (12 credits)
- Capstone (3 credits)

Required Courses (36 Credits)

Core Business Skills (12 Credits)

- MG-GY 6013 Organizational Behavior *3 Credits*
- MG-GY 6023 Economics & Strategy *3 Credits*
- MG-GY 6033 Financial Analysis for Tech Managers *3 Credits*
- MG-GY 7953 Global Innovation *3 Credits*

Technology Management Tools (9 Credits)

Select 3 of the following courses:

- MG-GY 6183 Communication for Technology Managers *3 Credits*
- MG-GY 6193 Statistics for Data Analysts *3 Credits*
- MG-GY 6203 Data Visualization for Business Intelligence *3 Credits*
- MG-GY 6303 Operations Management *3 Credits*
- MG-GY 6933 Information Technologies, Systems and Management in Organizations *3 Credits*
- MG-GY 8203 Project Management *3 Credits*
- MG-GY 8213 Information Security and Privacy for Managers *3 Credits*
- MG-GY 8303 Human Resource Management Systems *3 Credits*
- MG-GY 8363 Fundamentals of Information Security Management *3 Credits*
- MG-GY 9683 Internship and Action Learning *3 Credits*
- CP-GY 9911 Internship for MS I *1.5 Credits*
- or CP-GY 9921 Internship for MS II *1.5 Credits*

Elective Courses (12 Credits)

Continue creating a self-customized curriculum by organizing electives into "*Knowledge Areas*." These informal technology-based specializations reflect the recent directional advances in the field. However, students may elect a unique focus by creating a curriculum that includes courses across the prescribed Knowledge Areas: Global Tech Strategy, Business Design, Project Management, Data Analytics, Human Capital Engineering and Analytics. Please visit the Department webpage for the most recent elective offerings in these Knowledge Areas: https://engineering.nyu.edu/academics/programs/management-technology-ms-campus

Capstone Experience (3 Credits)

- MG-GY 9503 MOT Capstone Project Course *3 Credits*
  or
- MG-GY 9703 Project in Strategy and Innovation *3 Credits*
  or
- MG-GY 997X MS Thesis in Technology Management *3 Credits*

Mathematics, Examination Option and Designated Subspecialty Option, M.S.

Requirements for the Master of Science

A Bachelor's Degree in Mathematics is required for admission to this program. Students with degrees in other fields may possibly be admitted, with undergraduate deficiencies, at the discretion of departmental advisers. Before beginning graduate studies, students are expected to have completed a one-year course in advanced calculus.

Thirty credits are required. Six credits may be devoted to a thesis.

Required (core) courses, 12 credits, 3 credits each:

- MA-GY 7033 Linear Algebra I *3 Credits*
- MA-GY 7043 Linear Algebra II *3 Credits*
- MA-GY 6213 Elements of Real Analysis I *3 Credits*
- MA-GY 6223 Elements of Real Analysis II *3 Credits*

By Examination Option + Designated Sub-specialty Option:

Elective: *18 credits*. At least 9 credits in courses approved for specialization by Department.

Note:

Includes a comprehensive oral examination before the degree is awarded. Examinations cover the student's program of study and are scheduled towards the end of the semester in which the work is completed.

Total: 30 Credits

Mathematics, Examination Option, M.S.

Requirements for the Master of Science

A Bachelor's Degree in Mathematics is required for admission to this program. Students with degrees in other fields may possibly be admitted, with undergraduate deficiencies, at the discretion of departmental advisers. Before beginning graduate studies, students are expected to have completed a one-year course in advanced calculus.

Thirty credits are required. Six credits may be devoted to a thesis.

Required (core) courses, 12 credits, 3 credits each:

- MA-GY 7033 Linear Algebra I *3 Credits*
- MA-GY 7043 Linear Algebra II *3 Credits*
- MA-GY 6213 Elements of Real Analysis I *3 Credits*
- MA-GY 6223 Elements of Real Analysis II *3 Credits*

Electives:

18 credits, possibly with up to 9 from approved subspecialities in other departments.

Note:

Includes a comprehensive oral examination before the degree is awarded. Examinations cover the student's program of study and are scheduled towards the end of the semester in which the work is completed.

Total: 30 Credits

Mathematics, Thesis Option, M.S.

Requirements for the Master of Science

A Bachelor's Degree in Mathematics is required for admission to this program. Students with degrees in other fields may possibly be admitted, with undergraduate deficiencies, at the discretion of departmental advisers. Before beginning graduate studies, students are expected to have completed a one-year course in advanced calculus.

Thirty credits are required. Six credits may be devoted to a thesis.

Required (core) courses, 12 credits, 3 credits each:

- MA-GY 7033 Linear Algebra I *3 Credits*
- MA-GY 7043 Linear Algebra II *3 Credits*
- MA-GY 6213 Elements of Real Analysis I *3 Credits*
- MA-GY 6223 Elements of Real Analysis II *3 Credits*

Thesis Option:

Electives: *12 credits*
Master's Thesis: *6 credits*

Note:

Requires an examination of the thesis material by faculty advisers and certification that the work is satisfactory.

Total: 30 Credits

Mechanical Engineering, Controls and Dynamic Systems Specialty, M.S.

Requirements for the Master of Science

Course requirements for the MS in Mechanical Engineering are suited to the applicant's specialty, which is specified by the student in the admissions process or during the first advising session. Students must take at least 21 credits out of the 30 credits needed for the degree at the NYU Tandon School of Engineering. No more than 6 credits in "Guided Reading" courses are allowed. Validation credit is not allowed, but the graduate adviser may waive specific requirements (and substitute designated ones), based upon the student's prior studies or experience. Transfer credits are not granted for:

- undergraduate courses;
- courses counted toward satisfying undergraduate degree requirements;
- courses not related to the graduate program as stated in this catalog;
- courses that received a grade lower than B.

The degree requirements are:

- ME-GY 6003 Applied Mathematics in Mechanical Engineering *3 Credits*

- ME-GY 6043 Thermal Engineering Fundamentals *3 Credits*
- ME-GY 6213 Introduction to Solid Mechanics *3 Credits*
- ME-GY 6703 Linear Control Theory and Design I *3 Credits*
- ME xxxx Required for Specialty Area (see below) *6 Credits*
- ME xxxx Electives, approved by graduate adviser *6 Credits*
- Free Electives *6 Credits*

Total: 30 Credits

Note:

If students decide to do a ME 997x Master Thesis (9 credits) as part of their work for the degree, these 9 credits will be counted against 3 credits out of the 6 credits in ME electives, 3 credits out of the 6 credits in ME Required for the Specialty Area credits and 3 credits out of the 6 credits of Free Electives. Students are not allowed to submit more than three courses (9 credits) starting with a 5 for MS degree requirements satisfaction. Departmental electives include courses with a mechanical (ME), aerospace (AE) or materials (MT) prefix, plus departmental thesis or project credits. All courses and program details are subject to adviser approval.

Controls and Dynamic Systems Specialty

In the Controls and Dynamic Systems area, at least two graduate courses come from the list of courses under this heading. See courses below.

Required Courses

3 courses from

- ROB-GY 5103 Mechatronics *3 Credits*
- ME-GY 5653 Microelectromechanical Systems *3 Credits*
- ME-GY 6613 Sensor Based Robotics *3 Credits*
- ME-GY 6703 Linear Control Theory and Design I *3 Credits*
- ME-GY 6713 Linear Control Theory and Design II *3 Credits*
- ME-GY 7613 Nonlinear Systems: Analysis and Control *3 Credits*
- ME-GY 7623 Cooperative Control *3 Credits*
- ME-GY 7703 Optimal Robust Control *3 Credits*

Contact Information:

Departmental Adviser: Iskender Sahin
iskender.sahin@nyu.edu

Please note that the adviser (or lead faculty in specializations) also has some latitude for approving specialty courses.

Mechanical Engineering, Energy Engineering and Policy, M.S.

Requirements for the Master of Science

Course requirements for the MS in Mechanical Engineering are suited to the applicant's specialty, which is specified by the student in the admissions process or during the first advising session. Students must take at least 21 credits out of the 30 credits needed for the degree at the NYU Tandon School of Engineering. No more than 6 credits in "Guided Reading" courses are allowed. Validation credit is not allowed, but the graduate adviser may waive specific requirements (and substitute designated ones), based upon the student's prior studies or experience. Transfer credits are not granted for:

- undergraduate courses;
- courses counted toward satisfying undergraduate degree requirements;
- courses not related to the graduate program as stated in this catalog;
- courses that received a grade lower than B.

The degree requirements are:

- ME-GY 6003 Applied Mathematics in Mechanical Engineering *3 Credits*
- ME-GY 6043 Thermal Engineering Fundamentals *3 Credits*
- ME-GY 6213 Introduction to Solid Mechanics *3 Credits*
- ME-GY 6703 Linear Control Theory and Design I *3 Credits*
- ME xxxx Required for Specialty Area (see below) *9 Credits*
- ME xxxx Electives, approved by graduate adviser *6 Credits*
- Free Elective *3 Credits*

Total: 30 Credits

Note:

If students decide to do a ME-GY 997X MS Thesis (9 credits) as part of their work for the degree, these 9 credits will be counted against 6 credits out of the 6 credits in ME Required for the Specialty Area credits and 3 credits out of the 3 credits of Free Electives. Students are not allowed to submit more than three courses (9 credits) starting with a 5 for MS degree requirements satisfaction. All courses and program details are subject to adviser approval.

Energy Engineering and Policy Specialty

Additional Required Energy Courses

- ME-GY 6813 Energy Conversion Systems *3 Credits*
- ME-GY 6823 Energy Policy, Regulations, and Incentives *3 Credits*
- ME-GY 6833 Energy Project Financing *3 Credits*

Additional Electives

Two Energy Related Electives (6 Credits) from

- ME-GY 7063 Convective Heat Transfer *3 Credits*
- ME-GY 7083 Radiative Heat Transfer *3 Credits*
- ME-GY 6153 Thermodynamics of HVAC Systems *3 Credits*
- ME-GY 6163 Fluid Mechanics for HVAC Systems *3 Credits*

- ME-GY 6173 Heat Transfer for HVAC Systems *3 Credits*
- ME-GY 6183 Design of HVAC Systems *3 Credits*

Free Elective (3 Credits)

Contact Information:

Departmental Adviser: Iskender Sahin
iskender.sahin@nyu.edu

Please note that the adviser (or lead faculty in specializations) also has some latitude for approving specialty courses.

Mechanical Engineering, Fluid Dynamics and Thermal Systems, M.S.

Requirements for the Master of Science

Course requirements for the MS in Mechanical Engineering are suited to the applicant's specialty, which is specified by the student in the admissions process or during the first advising session. Students must take at least 21 credits out of the 30 credits needed for the degree at the School of Engineering. No more than 6 credits in "Guided Reading" courses are allowed. Validation credit is not allowed, but the graduate adviser may waive specific requirements (and substitute designated ones), based upon the student's prior studies or experience. Transfer credits are not granted for:

- undergraduate courses;
- courses counted toward satisfying undergraduate degree requirements;
- courses not related to the graduate program as stated in this catalog;
- courses that received a grade lower than B.

Degree Requirements:

- ME-GY 6003 Applied Mathematics in Mechanical Engineering *3 Credits*
- ME-GY 6043 Thermal Engineering Fundamentals *3 Credits*
- ME-GY 6213 Introduction to Solid Mechanics *3 Credits*
- ME-GY 6703 Linear Control Theory and Design I *3 Credits*
- ME xxxx Required for Specialty Area (see below) *6 Credits*
- ME xxxx Electives, approved by graduate adviser *6 Credits*
- Free Electives *6 Credits*

Total: 30 Credits

Note:

If students decide to do ME-GY 997X MS Thesis in Mechanical Engineering (9 credits) as part of their work for the degree, these 9 credits will be counted against 3 credits out of the 6 credits in ME electives, 3 credits out of the 6 credits in ME Required for the Specialty Area credits and 3 credits out of the 6 credits of Free Electives. Students are not allowed to submit more than three courses (9 credits) starting with a 5 for MS degree requirements satisfaction.

Departmental electives include courses with a mechanical (ME), aerospace (AE) or materials (MT) prefix, plus departmental thesis or project credits. All courses and program details are subject to adviser approval.

Fluid Dynamics And Thermal Systems Specialty

In the Fluid Dynamics and Thermal Systems area, at least two graduate courses come from the list of courses under this heading. See courses below.

- ME-GY 6153 Thermodynamics of HVAC Systems *3 Credits*
- ME-GY 6163 Fluid Mechanics for HVAC Systems *3 Credits*
- ME-GY 6173 Heat Transfer for HVAC Systems *3 Credits*
- ME-GY 6183 Design of HVAC Systems *3 Credits*
- ME-GY 7063 Convective Heat Transfer *3 Credits*
- ME-GY 7073 Conductive Heat Transfer *3 Credits*
- ME-GY 7083 Radiative Heat Transfer *3 Credits*
- ME-GY 7113 Viscous Flow and Boundary Layers *3 Credits*
- ME-GY 7133 Compressible Flow *3 Credits*
- ME-GY 7153 Computational Fluid Mechanics and Heat Transfer *3 Credits*

Contact Information:

Departmental Adviser: Iskender Sahin
iskender.sahin@nyu.edu

Please note that the adviser (or lead faculty in specializations) also has some latitude for approving specialty courses.

Mechanical Engineering, Mechanics and Structural Systems Specialty, M.S.

Requirements for the Master of Science

Course requirements for the MS in Mechanical Engineering are suited to the applicant's specialty, which is specified by the student in the admissions process or during the first advising session. Students must take at least 21 credits out of the 30 credits needed for the degree at the NYU Tandon School of Engineering. No more than 6 credits in "Guided Reading" courses are allowed. Validation credit is not allowed, but the graduate adviser may waive specific requirements (and substitute designated ones), based upon the student's prior studies or experience. Transfer credits are not granted for:

- undergraduate courses;
- courses counted toward satisfying undergraduate degree requirements;
- courses not related to the graduate program as stated in this catalog;
- courses that received a grade lower than B.

The degree requirements are:

- ME-GY 6003 Applied Mathematics in Mechanical Engineering *3 Credits*
- ME-GY 6043 Thermal Engineering Fundamentals *3 Credits*

- ME-GY 6213 Introduction to Solid Mechanics *3 Credits*
- ME-GY 6703 Linear Control Theory and Design I *3 Credits*
- ME xxxx Required for Specialty Area (see below) *6 Credits*
- ME xxxx Electives, approved by graduate adviser *6 Credits*
- Free Electives *6 Credits*

Total: 30 Credits

Note:

If students decide to do a ME 997x Master Thesis (9 credits) as part of their work for the degree, these 9 credits will be counted against 3 credits out of the 6 credits in ME electives, 3 credits out of the 6 credits in ME Required for the Specialty Area credits and 3 credits out of the 6 credits of Free Electives. Students are not allowed to submit more than three courses (9 credits) starting with a 5 for MS degree requirements satisfaction. Departmental electives include courses with a mechanical (ME), aerospace (AE) or materials (MT) prefix, plus departmental thesis or project credits. All courses and program details are subject to adviser approval.

Mechanics and Structural Systems Specialty

In the Mechanics and Structural Systems area, at least two graduate courses come from the list of courses under this heading. See courses below.

- ME-GY 5243 Composite Materials *3 Credits*
- ME-GY 5443 Vibrations *3 Credits*
- ME-GY 6213 Introduction to Solid Mechanics *3 Credits*
- ME-GY 6223 Advanced Mechanics of Materials *3 Credits*
- ME-GY 6253 Mechanics of Nanomaterials *3 Credits*
- ME-GY 6513 Advanced Dynamics *3 Credits*
- ME-GY 7213 Elasticity I *3 Credits*
- ME-GY 7243 Advanced Composite Materials *3 Credits*
- ME-GY 7323 Failure Mechanics *3 Credits*
- ME-GY 7333 Non-Destructive Evaluation (NDE) *3 Credits*
- ME-GY 7353 Fracture Mechanics *3 Credits*
- ME-GY 7443 Advanced Vibrations *3 Credits*
- ME-GY 8213 Elasticity II *3 Credits*
- ME-GY 8273 Mechanics of Cellular Materials *3 Credits*

Contact Information:

Departmental Adviser: Iskender Sahin
iskender.sahin@nyu.edu

Please note that the adviser (or lead faculty in specializations) also has some latitude for approving specialty courses.

Mechatronics and Robotics, M.S.

Requirements for the Master of Science

To complete this M.S. degree, 30 credits as specified below must be completed.

- four 3 credit core courses that will introduce students to fundamental elements of modeling, hardware, and software relevant to mechatronics and robotics
- one 3 credit course will introduce students to fundamentals of entrepreneurship and innovation to enable them to link their technical education with potential to launch businesses
- two 3 credit project courses will allow students to acquire hands-on learning and experience in integrating their coursework to create concrete illustrations of mechatronics and robotic devices (alternatively, 6 credit thesis research)
- to specialize in a focused area of mechatronics and robotics, students will select up to two 3 credit courses from a list of elective courses
- one 3 credit free elective course with advisor approval

Required Courses (15 Credits)

- ROB-GY 5103 Mechatronics *3 Credits*
- ROB-GY 6003 Foundations of Robotics *3 Credits*
- ROB-GY 6103 Advanced Mechatronics *3 Credits*
- ME-GY 6923 Simulation Tools for Robotics *3 Credits*
- MG-GY 7703 Entrepreneurship *3 Credits*

Specialty (6 Credits)

Two courses from the same specialty area must be taken from the following list to develop a specialization:

Assistive Mechatronic and Robotic Technologies

- ROB-GY 6313 Robotic Gait and Manipulation *3 Credits*
- ROB-GY 6413 Robots for Disability *3 Credits*
- ROB-GY 6423 Interactive Medical Robotics *3 Credits*

Mobile Robotics

- ROB-GY 6203 Robot Perception *3 Credits*
- ROB-GY 6213 Robot Localization and Navigation *3 Credits*
- ROB-GY 6323 Reinforcement Learning and Optimal Control for Robotics *3 Credits*
- ROB-GY 6333 Swarm Robotics *3 Credits*

Microrobotics

- ME-GY 7953 Introduction to Smart Materials and Structures *3 Credits*
- ROB-GY 6113 Microelectromechanical Sensors and Actuators for Robots *3 Credits*

Free Elective (3 Credits)

Free elective suggestions:

- MG-GY 7703 Entrepreneurship *3 Credits*
- MG-GY 7743 Advanced Trends in Technology Management and Innovation *3 Credits*
- MG-GY 7861 High-technology Entrepreneurship *1.5 Credits*
- MG-GY 7871 Intellectual Property for Technology and Information Managers *1.5 Credits*
- MG-GY 8653 Managing Technological Change and Innovation *3 Credits*

Project Courses (6 Credits)

Students must complete either two 3-credit project courses or they can enroll in one 6-credit thesis course.

Total: 30 Credits

Transportation Management, M.S.

Master of Science in Transportation Management

The program is for practicing professionals who deal with a public transit system, and agency and/or facility management. It combines basic management skills with a working knowledge of techniques and approaches to optimize transportation system results.

Goals and Objectives

The primary goal of the MS in Transportation Management is to prepare professionals to effectively and efficiently manage various transportation enterprises. The emphasis is on agencies, facilities and services in the public sector. Specific objectives of the program are to provide:

- a basic background in management skills and techniques, specifically as applied to public and private transportation organizations;
- basic understanding of the economic aspects of the transportation sector;
- an understanding of the importance of national, state and local transportation policy on public and private sector organizations;
- fundamental knowledge on some specific issues and problems in managing and operating public transportation facilities.

Program Requirements

Required Courses: 15 Credits

The following courses are required of all students:

- TR-GY 6053 Transportation Economics and Finance Fundamentals *3 Credits* [1]
- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*
- TR-GY 7223 Management of Transit Maintenance and Operations *3 Credits*
- TR-GY 7213 Transportation Management *3 Credits* OR CE-GY 8203 Project Management *3 Credits* OR CE-GY 8253 Project Management for Construction *3 Credits*
- TR-GY 7133 Urban Public Transportation Systems *3 Credits*

Electives: 15 Credits

Students will take elective courses in the following areas:

- Management Electives (MG or CE, subject to prerequisites), *6 credits*
- 9 elective courses subject to advisor approval

Note:

[1] Effective Spring 2019. Students entering the MS program prior to Spring 2019 may take TR-GY 6011 Fundamental Concepts in Transportation *1.5 Credits* and TR-GY 6211 Economic Analysis of Transportation Alternatives *1.5 Credits* in place of TR-GY 6053.

Transportation Planning and Engineering, M.S.

Master of Science in Transportation Planning and Engineering

The MS program has a strong foundation in traffic engineering, transportation planning, transportation economics, public transportation systems and intelligent transportation systems. Students are exposed to a learning atmosphere that provides a meaningful combination of theoretical and practical approaches. Courses include a mix of presentations, workshop and project exercises, and practical problem solutions.

The program focuses on (1) material suited to the issues and projects students will face on the job, so that they are immediately productive; (2) material packaged by the course so that each course provides specific skills and knowledge, enabling the student to be immediately productive; (3) project-based learning in multiple courses, as an underlying approach to teaching the courses and the program; (4) modern tools integrated into the courses, including, but not limited to: Synchro and SIM-Traffic and HCS+; (5) design problems taught through a project/case studies approach; (6) statistics integrated into courses, with moderately advanced skills in Excel and Word expected in all courses (but not explicitly taught).

The program includes a strong focus on the rapidly emerging field of intelligent transportation systems. This field applies telecommunications and information technology to solving a variety of transportation functions, from route guidance systems to automated toll collection systems to the automated highway.

Goals and Objectives

The primary goal of the MS in Transportation Planning and Engineering is to prepare transportation professionals to plan, functionally design, control and operate facilities, systems and services that satisfy the demand for passenger and freight transportation. Specific objectives of the program are to provide the skills necessary to:

- Fundamentally understand the nature and generation of transportation AIMSUN demands;
- Understand the political, policy and economic forces that affect transportation demands and the public framework in which they are addressed;
- Control and operate traffic and other transportation facilities; and
- Apply information technologies to intelligent transportation systems.

Program Requirements

Required Courses: 21 Credits

- TR-GY 6013 Fundamental Concepts in Transportation *3 Credits*
- TR-GY 6113 Forecasting Urban Travel Demand *3 Credits*
- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*
- TR-GY 6333 Transportation & Traffic Concepts *3 Credits*
- TR-GY 6343 Traffic Operations & Control *3 Credits*
- TR-GY 6403 Transportation and Traffic Project *3 Credits* [1]
- TR-GY 7013 Urban Transportation & Logistics Systems *3 Credits*

Electives: Select 9 Credits (see Note 2 below)

- TR-GY 7033 Multimodal Transportation Safety *3 Credits*
- TR-GY 7073 Travel Behavioral Informatics *3 Credits*
- TR-GY 7123 Management of Urban Traffic Congestion *3 Credits*
- TR-GY 7133 Urban Public Transportation Systems *3 Credits*
- TR-GY 7213 Transportation Management *3 Credits*
- TR-GY 7223 Management of Transit Maintenance and Operations *3 Credits*
- TR-GY 7243 Intelligent Transportation Systems: Deployments and Technologies *3 Credits*
- TR-GY 7323 Design of Parking and Terminal Facilities *3 Credits*
- TR-GY 7353 Data-driven Mobility Modeling and Simulation *3 Credits*
- TR-GY 8013 Selected Topics in Transportation I *3 Credits*
  and/or
  TR-GY 8023 Selected Topics in Transportation II *3 Credits*
- TR-GY 8011 Special Topics in Transportation A *1.5 Credits*
  and/or
  TR-GY 8021 Special Topics in Transportation B *1.5 Credits*
- TR-GY 900X Readings in Transportation *Variable Credits*
- TR-GY 997X MS Thesis in Transportation *3 Each Credits*

Notes

[1] Students have the option of doing a 6-credit MS thesis in place of TR-GY 6403 Transportation and Traffic Project plus one elective.

[2] Other electives are allowed besides the ones listed, such as any course at CUSP or other CE courses, or from other schools with permission of advisor.

Urban Infrastructure Systems, M.S.

With the fast growth of urban population local governments, public service agencies, and urban utilities presently face increasing public demand for greater reliability, safety, affordability and resiliency of the aging urban infrastructure systems. These systems have to be continuously adapted and upgraded (often with technology-driven solutions) to efficiently support the essential public services, urban development and economic growth.

The infrastructure systems support a variety of urban sectors, including transportation, energy & water supply, sanitation & wastewater management, public buildings, district heating, public health & safety, waste management, telecommunication and other essential services. Their sustainable development engages a wide variety of public and private sector stakeholders and greatly depends on a broad range of institutional, environmental, economic, societal and operational factors. Such factors include public policy objectives, land use and geo-physical system characteristics, regulatory requirements, environmental issues, availability of renewable resources, customers' awareness and culture, management capabilities, and other operational state variables. With rising societal concerns with regard to climate change impact, environmental sustainability and economic viability of the fast-growing urban centers, both Government and Industry presently face increasing needs for innovative capabilities of dynamic monitoring and "smart" system control to effectively meet the challenge of upgrading the aging urban infrastructure systems.

Facing these urban sustainability challenges, recent developments of Information Technology based "smart" infrastructure monitoring and control capabilities have been increasingly integrated in operation system optimization, early incident detection and proactive mitigation, for upgrading the operational efficiency, safety and service quality of the infrastructure systems. These innovative solutions are currently driving a significant paradigm shift from reactive to preemptive engineering and management of these urban systems, across the wide array of public service sectors that they support. The infrastructure industry development goal is to provide the engineers and managers of the urban systems with upgraded decision making capabilities to better cope with the growing environmental risks, economic constraints, and complex operational uncertainties and effectively respond to the growing societal demand.

The interdisciplinary MS Program in Urban Infrastructure Systems targets the development of a broad understanding of the infrastructure management challenges facing metropolitan governments and urban utilities. Cutting across different disciplines of engineering, infrastructure financing, environmental policy and planning, the program is focused on the needs and methodologies for integrating policy decision making, intelligent technology solutions, and risk-based system analysis in urban infrastructure systems management to effectively meet the emerging challenges of sustainable urban developments. Following five core courses, students may select an area of specialization in a specific urban sector, as indicated in the list of proposed majors. They are also required to complete a 3-credit Capstone project or a 6-credit Master Thesis.

With specialized faculty members from Government, Industry and Academia, the program is designed for professionals, with both engineering and non-engineering backgrounds, who are involved and/or interested in the fast growing interdisciplinary field of urban systems management and career opportunities with government agencies, public and private sector utilities, and service industries across the wide array of the metropolitan sectors.

To accomplish these objectives the program includes:

- Core courses (5 courses, 3 credits each) related to challenges of infrastructure management strategies across the sectors.
- Majors (3 to 4 courses, 3 credits each) related to infrastructure management strategies for selected urban sectors, including: Urban Transportation Planning & Management, Urban Water Supply & Environmental Systems management, Smart Building & Energy Supply, Urban Construction Engineering & Management and Infrastructure Systems Planning & Management.
- Interdisciplinary Capstone Project (3 credits) or MS Research Thesis (6 credits) on a selected topic.

Requirements for the Master of Science

Program Core: 15 Credits

All students must complete the following five courses [1]:

- CE-GY 7813 Infrastructure Planning, Engineering and Economics *3 Credits*
- CE-GY 7843 Urban Infrastructure Systems Management *3 Credits*
- CE-GY 7853 Infrastructure Asset Management *3 Credits*
- CE-GY 7673 Environmental Impact Assessment *3 Credits*
- CE-GY 8733 Infrastructure Financing: Structuring of a Deal *3 Credits* [2]

Note:

[1] Core courses can be substituted by other selected courses upon approval of the academic advisor.

[2] Course is part of the Exec 21 program; special requirements (see Construction Management Program) or permission of adviser required.

Minor, Technical and Free Electives:

Each minor area of study includes: (1) three minor courses, required for the minor; and (2) two to three technical electives, available to all program students.

Students may elect not to take a specified minor area. They may, instead, take five or six technical electives from the approved list in any specified area. The number of technical electives is influenced by whether the student elects to do a 3-credit case study report or a 6-credit MS thesis, as described in a later section.

Minor Areas of Concentration

- Transportation Systems Management (TSM)
- Construction Management (CM)
- Environmental Systems Management (ESM)
- Civil Infrastructure Systems Management (CISM)

Because of course content, students selecting the CISM minor should hold a BS in Civil Engineering or the equivalent.

Minor in Transportation Systems Management

Credits required in the minor:

- TR-GY 7223 Management of Transit Maintenance and Operations *3 Credits*
- TR-GY 6223 Intelligent Transportation Systems and Their Applications *3 Credits*
- TR-GY 7133 Urban Public Transportation Systems *3 Credits*

Approved Technical Electives in Transportation

- TR 6133 Travel Demand Forecasting *3 Credits*
- TR-GY 7123 Management of Urban Traffic Congestion *3 Credits*

Note:

Additional electives may be approved by the adviser.

Minor in Construction Management

Required in Minor:

- CE-GY 8253 Project Management for Construction *3 Credits*
- CE-GY 8713 Construction and the Law *3 Credits* [2]
- CE-GY 8723 How to Succeed in Construction *3 Credits* [2]

Note:

[2] Course is part of the Exec 21 program; special requirements (see Construction Management Program) or permission of adviser required.

Approved Technical Electives in Construction:

- CE-GY 8273 Contracts and Specifications *3 Credits*
- CE-GY 8783 Construction Management and Planning *3 Credits* [2]
- CE-GY 8703 Managing and Leading in the 21st Century *3 Credits* [2]

Note:

Additional electives may be approved by the adviser.

[2] Course is part of the Exec 21 program; special requirements (see Construction Management Program) or permission of adviser required.

Minor in Environmental Systems Management

Credits required in the minor:

- CE-GY 7753 Environmental Systems Management *3 Credits*
- CE-GY 7533 Hazardous/Toxic Waste Management *3 Credits*
- CE-GY 7563 Environmental Law *3 Credits*

Approved Technical Electives in Environmental Studies:

- CE-GY 7473 Modeling Fate and Transport of Surface Water Pollution *3 Credits*
- CE-GY 7523 Air Pollution *3 Credits*
- CE-GY 7543 Site Remediation *3 Credits*
- CE-GY 6053 Monitoring Cities *3 Credits*

Note:

Additional electives may be approved by the adviser.

Minor in Civil Infrastructure Systems Management

Recommended courses which can be substituted upon approval of the academic advisor:

- CE-GY 7863 Infrastructure Monitoring and Performance Assessment *3 Credits*
- CE-GY 6063 Bridge Engineering *3 Credits*
- CE-GY 8433 Urban Geotechnology *3 Credits*

Approved Technical Electives in Infrastructure Systems:

- CE-GY 6143 Steel Structures *3 Credits*

- CE-GY 8433 Urban Geotechnology *3 Credits*
- CE-GY 8493 Environmental Geotechnology *3 Credits*

Note:

Additional electives may be approved by the adviser.

Capstone Experience

Students fulfill the requirement for a meaningful Capstone experience by completing an independent case study in urban infrastructure systems (3 credits) or a master's thesis on a topic of independent study (6 credits).

All course descriptions for Urban Infrastructure Systems are found in the Civil Engineering section of this catalog.

Doctor of Philosophy

Biomedical Engineering, Ph.D.

The primary goal of the PhD in Biomedical Engineering [BME] is to provide students with an in-depth, advanced education that will give them the tools needed to perform fundamental and applied research in biomedical engineering. Alternatively, students will gain the requisite technical knowledge that they may wish to apply to management, marketing, sales, and other entrepreneurial activities related to biomedical engineering.

Specific Objectives include:
• To provide students that have either a BS or an advanced degree in any engineering; mathematics; or natural science discipline with a tailored program of study that will ensure their competency and competitiveness in BME.
• To provide students with a cutting edge program that integrates engineering, biological and medical sciences such that students will acquire the requisite skills to participate in technological innovations that provide people with longer, healthier and more productive lives.
• To better accomplish the above, to merge the leadership and talents found at NYU Tandon in chemistry, engineering and computer science with the expertise in medical sciences at the Health Sciences Center at SUNY Downstate Medical Center.
• To give students an opportunity to focus on topics that include: 1) Biomaterials and Polymer Therapeutics; 2) Bio-imaging and Neuro-engineering.
• To give students the option of doing research in the laboratories at NYU Tandon or SUNY Downstate Medical Center. Students may also substitute research units with course electives.

STRUCTURE AND REQUIREMENTS FOR DEGREE COMPLETION:
The PhD degree in Biomedical Engineering is awarded to a student upon successful completion of 75 credits and the defense of a comprehensive thesis research project. The credits are broken down as 39 course credits and 36 doctoral thesis research credits. A maximum of 30 course credits may be transferred from previous graduate course work. Thesis credits can only be taken upon passing the qualifying exam.

The program has three separate, entry-level pathways to accommodate students entering with a bachelor's degree in any of the following disciplines: (1) chemical engineering; (2) mechanical engineering, electrical engineering, computer science engineering or physics; and (3) chemistry, biology or premedical studies. By accommodating these students with varying academic backgrounds, we intend to further encourage communication, in keeping with the interdisciplinary nature of biomedical engineering. Students will be required to take at least one, but not more than two, of NYU Tandon School of Engineering's management of technology courses. Students will be obliged to participate in BE-GY 9753 Bioethics Seminar, a course on responsible conduct in research, as required by the National Institutes of Health (NIH) for training grant funding joint institutionally; to participate in Journal Clubs; and to attend the jointly sponsored SUNY/NYU Tandon Biomedical Engineering Seminar Series. The required PhD thesis research may be conducted under the supervision of a faculty member from either institution. We expect that these students will need four to six years to complete the doctoral program, depending upon their admission status.

Candidates whose thesis research advisors are NYU Tandon faculty will be required to register at NYU Tandon and will accumulate a minimum total of 75 credits; whereas those candidates whose thesis research advisers are SUNY Downstate [SGS] faculty will be required to register at Downstate and will accumulate the requisite number of credits specified by SGS's degree requirement. The same joint PhD degree will be conferred regardless of the campus at which the student registers; the research requirements for all graduate students in the program are identical.

Each student will be required to register for all of the courses through the standard registration process at student's home institution, irrespective of where the courses are actually held. The Registrars at each institution will keep accounts of the numbers of credits taken by their BME PhD students at the alternate institution. Those credits will be tallied at the close of every two academic years, or every other June.

Passing a doctoral qualifying examination, scheduled within the first two years, is required to advance to candidacy for the PhD degree. Students are directed to read the information within the **Qualifying Examination Guidelines**, below. In the case of failure, the right to a second examination is at the discretion of the examination committee in consultation with the BME program directors at NYU Tandon and SUNY Downstate, and the graduate dean or associate dean from the campus at which the BME student is enrolled. The results of each student's examination will be delivered to the Registrar of the NYU Tandon and SGS, in writing, no later than one week following the exam.

PROGRAM ADMISSION

An admission committee composed of faculty from both SGS and NYU Tandon will review BME PhD applications. Requirements for acceptance to the program will include (1) academic excellence, (2) interests congruent with those of program faculty, and (3) positive recommendations from former research advisors. Admissions committee member and faculty members whose research interests match those of the candidate, either in person or by a conference call, will interview all viable candidates.

Bachelor's level students accepted into the BME PhD program will be expected to register at the campus where the faculty research best matches their own interests. While this early commitment to a research area is dissimilar to other doctoral programs at SGS, it is essential given the early tuition and stipend obligations at NYU Tandon . A faculty thesis advisor must accept students with an MS who wish to enter the BME PhD before they will be allowed to enroll.

Thesis Research: Procedures for academic advising, and for supervision and evaluation of students' progress through degree completion.

Members of the student's thesis/advisory committee, with the participation of the BME program director, will monitor the individual student's progression through the BME PhD program, as in the other doctoral programs at SGS and NYU Tandon. To accommodate the changing needs of each student based upon his or her research project, the composition of the committee is designed for flexibility. At each stage of a student's career it is important to determine if they are progressing at a rate sufficient for success as a doctoral candidate. This includes the successful and timely completion of course work and examinations. The following schedule is suggested:

Year 1: Both BS or MS level students are expected to register for course work to prepare for their doctoral qualifying examination.

Year 2: The qualifying examination committee will be formed and consist of three members; one must hold a PhD in an engineering discipline. Student will take the doctoral qualifying examination. Those that pass are allowed to continue to year 3 as doctoral candidates and will be allowed to register for BE-GY 999X PhD Thesis Research in Biomedical Engineering.

Year 3: The thesis/advisory committee will be formed. This committee will consist of six members, selection of which will be primarily based on the area of the student's research. All attempts should be made to include a least two members from the student's qualifying exam committee, one member should have expertise within the track focus chosen by the student; one member should have a PhD in engineering; two members should be from a department other than the one in which the thesis advisor is affiliated. The sixth member, an outside examiner, should be selected and be present at the thesis pre-defense, and may also become involved in the proposal defense, at the student and advisor's invitation.

Year 4: The thesis/advisory committee, including the external member, will monitor student progress during the thesis pre-defense. Internal members of the thesis research advisory committee monitor the thesis defense; attendance by the external member at the thesis defense is optional.

Below is a chronological description of the process by which a student will progress from thesis proposal to thesis defense.

Student submits written version of thesis proposal to the committee two weeks in advance of the Oral Proposal defense.

1. Oral Proposal Defense. This is a formal presentation by the student before the program's students and faculty.
2. Chair of committee writes a letter to the student containing the committee's determination of the proposal defense (Acceptable, Acceptable with Modifications or Unacceptable). The letter should describe what experiments are required for completion of the thesis work. This is a contract with the student.
3. Student submits written thesis to committee, including to the outside examiner, two weeks in advance of the Pre-defense of the thesis.
4. Pre-defense. Student must defend a written document and respond to questions regarding research. (The format is oral. A formal presentation on the part of the student is discouraged; a brief informal presentation may occur if desired by the chairman.)
5. Chair of committee writes a letter to student containing the committee's determination of what changes are required for the final document.
6. Student submits final document to committee members two weeks prior to the defense, or one week if agreed upon by all committee members.
7. Defense. First there is a formal, public presentation by the student, with questions from the audience. Following the public presentation, the student meets privately with the committee members for questions. The committee makes a decision that is then transmitted, in writing, to the Registrar.

QUALIFYING EXAM GUIDELINES

A two-part qualifying examination, scheduled for no later than the fall semester of the second year, is required to advance to candidacy for the Ph.D. degree. Students must submit a formal application to take the exam during registration for the spring semester of that year. The application should include the names of three or more faculty who are willing to serve on the qualifying examination committee; these must be approved by the Program Director of the student's home campus. The committee must have at least one faculty member from the campus not directly sponsoring the student, and a member or designee of the executive committee.

The purpose of the qualifying examination is to test general knowledge of Bioengineering, and in particular knowledge that is pertinent to the track in which the student is enrolled, and is intended to discern the student's ability to communicate ideas and concepts. While the exam is a test of general knowledge, students are expected to be especially knowledgeable in the scientific area related to their proposed research.

The format of the examination is in two parts. In part one the student will receive one essay question from each of the examiners that they will have one week to answer. The thesis examining committee will either pass or fail the student on this written part. If this part of the examination is passed, the student will be allowed to take the oral part of the examination.

During the oral part of the examination, questions from the committee will not necessarily be limited to the student's essay questions, but may cover other aspects of the student's academic training up to that point. The intent is to focus the committee's attention, and to make the members aware of the areas of interest in which the student might be expected to have particular knowledge.

The examination will be graded as pass or fail by majority vote. In the case of failure, the right to a second examination is at the discretion of the executive committee and the Graduate Dean or Associate Dean for Biomedical Engineering of the campus at which the student is enrolled. An unsatisfactory performance in the qualifying examination may result in cancellation of the student's registration in the sponsoring program. The decision of whether to cancel registration in the program or to offer an opportunity for reexamination is made by the Executive Committee of the Program on the basis of the student's overall academic performance. This decision is not subject to formal appeal.

The result of each student's examination will be delivered to the Graduate School, in writing, no later than one week following the exam.

Chemical Engineering, Ph.D.

Requirements for the Doctor of Philosophy in Chemical Engineering

Each doctoral candidate must complete a minimum of 75 credits of academic work past the bachelor's degree, including a minimum of 36 credits of dissertation research, to complete the PhD in Chemical Engineering program. A minimum of 30 graduate credits beyond the bachelor's degree (not including PhD dissertation and non-dissertation research credits) are required in chemical engineering or related subjects. Of the 30 credits, 12 are to be taken as part of the required graduate core courses in Chemical Engineering and 18 are taken as electives. For electives: at least 3 electives (9 credits) are to be chosen from approved CBE courses, 6000-level and above. The remaining electives need to be selected in consultation with and with the explicit approval from the chemical engineering graduate adviser. In addition to the required coursework, attendance is required at departmental colloquia.

Students must also pass a comprehensive qualifying examination in chemical engineering and present a doctoral dissertation. The qualifying exam is given once a year. Additional details on the qualifying examination will be provided by the graduate adviser.

To meet graduation requirements, students must have an overall GPA of 3.0 or higher, excluding dissertation credits, and must not obtain a grade of C or lower in more than two required core courses.

A student who has earned graduate level credits and/or been awarded an MS degree should consult with the graduate adviser for course registration and possible credit transfer.

Candidates for the degree Doctor of Philosophy in Chemical Engineering should plan their programs in accordance with the following requirements:

Required Subjects: 12 credits, 3 credits each

- CBE-GY 6153 Applied Mathematics in Engineering *3 Credits*
- CBE-GY 6333 Transport Phenomena *3 Credits*
- CBE-GY 6733 Chemical Engineering Thermodynamics *3 Credits*
- CBE-GY 6813 Chemical Reactor Analysis and Design *3 Credits*
- CBE-GY 9910 Colloquium in Chemical and Biomolecular Engineering *0 Credits* *
- CBE-GY 9920 Colloquium in Chemical and Biomolecular Engineering *0 Credits* *

Electives: 18 Credits

At least three electives (9 credits) must be chosen from approved CBE courses, 6000-level and above.

The remaining courses may be chosen from other graduate programs with the approval of the graduate adviser in chemical engineering.

Dissertation: 36 Credits

- CBE-GY 999X PhD Dissertation in Chemical & Biological Engineering *36 Credits total, each 3 Credits*

Note:

Up to 9 credits of CBE-GY 998X Research in Chemical & Biomolecular Engineering can be included here.

Total: 75 Credits

Additional Requirements:

- **Required safety training:** All graduate students in PhD Chemical Engineering must enroll in (on BioRaft) and complete three one-hour training sessions offered by the NYU EHS (Environmental Health and Safety) Office in the first semester. The three sessions are: Lab Safety, Waste Management and Biosafety. Student must show proof (e.g. certificate) that they completed this training to their advisors. Each subsequent fall they must take three online refresher sessions until they graduate.
- CBE-GY 9910/CBE-GY 9920 must be taken each semester.

Civil Engineering, Ph.D.

Doctoral Program in Civil Engineering

The Department of Civil and Urban Engineering currently offers two doctoral degree programs: PhD in Civil Engineering and PhD in Transportation Planning and Engineering. Requirements for the Civil Engineering degree are detailed here. For information on the Transportation Planning and Engineering program, see the "Transportation" section of this catalog.

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.

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.

Program Adminstration

The Department of Civil and Urban Engineering has five graduate program coordinators:

- Graduate Program Coordinator for Civil Engineering (MS and PhD)
- Graduate Program Coordinator for Environmental Engineering/ Environmental Science (MS)
- Graduate Program Coordinator for Urban Infrastructure Systems (MS)
- Graduate Program Coordinator for Transportation (MS and PhD)
- Graduate Program Coordinator for Construction Management and Engineering (MS)

The graduate coordinators form the departmental Graduate Committee. The Committee reviews all PhD applications and makes admissions decisions, which are implemented by a graduate coordinator. For each registration, the student's program must be approved by the academic adviser and signed by the graduate coordinator.

Admission Criteria

1. Admission to the PhD in Civil Engineering requires an MS in Civil Engineering or equivalent with a GPA of 3.5 or better (on a 0-4 scale).
2. All applicants are required to submit GRE scores for consideration.
3. International applicants must take the TOEFL examination and submit the results for consideration.

In criterion 1 above, the "equivalent" can be achieved in several ways. The candidate may have a MS degree with a different title that covers substantially the same material. In more general terms, the applicant must demonstrate that he or she has the equivalent of all undergraduate and master's-level course work to be able to pursue doctoral-level work in the chosen major area, as well as in a minor area within the umbrella of civil engineering. Further, "equivalence" is evaluated based on the totality of the student's undergraduate and graduate record, not course by course. Thus, an applicant who wishes to pursue doctoral work in Environmental Engineering, for example, must have the entire undergraduate and master's-level course background expected in Environmental Engineering, but need not demonstrate such a background in structures. Because admission to a PhD program requires a relevant MS (or equivalent), an applicant who has not yet earned a master's degree will be admitted as MS student and is expected to earn an MS degree while completing the major and minor course requirements. In rare cases, an applicant with only a BS degree may be directly admitted into the PhD program with the written approval of the department head.

Doctoral Program of Study

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 student's academic adviser plans a program to fulfill major and minor requirements for the PhD degree. The Academic Advisory Committee generally consists of the academic adviser and one faculty member for each 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.

Doctoral Degree Requirements

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

1. 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 0-4 scale). Up to 6 credits of the 54 credits may be satisfied by individual guided studies, readings, projects and theses.
2. 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:
    - CE 9998: Independent original investigation demonstrating creativity and scholarship worthy of publication in a recognized engineering journal. Registration for a minimum of 6 credits is required before registering for CE-GY 999X .
    - CE-GY 999X : 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 per semester is permitted. In the final semester of work, registration for credit is permitted with the approval of the department head. *Prerequisites: CE 9998 (6 credits), degree status, successful completion of doctoral qualifying examinations and approval of the dissertation adviser.*
3. Completion of two minor areas of study, as follows:

- Out of Department Minor: Completion of 9 credits of graduate or undergraduate course work in one or two technical areas of study.
- In-Department Minor: Completion of 6 credits of graduate course work in a minor area outside the major subdiscipline in civil engineering.

4. Residency requirements for the PhD in Civil Engineering include the 21-credit dissertation plus a minimum of 15 credits of applicable graduate course work taken at NYU Polytechnic School of Engineering.
5. In satisfying the 54-credit course requirement (requirement 1), the student must satisfy all requirements for the major and minor areas selected, or their equivalents.
6. In satisfying these basic PhD requirements, students also must satisfy one of the two following conditions:
    a. 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 0-4 scale).
    b. 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 0-4 scale). Satisfying condition 6b requires that the department accept the student's MS degree *in toto* without regard to its specific content. This acceptance requires a recommendation from the department's Graduate Committee and department head approval.
2. 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.

Transfer Credits

A maximum of 39 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.

Qualifying Examination

A student must register for RE-GY 9990 PhD Qualifying Exam in the semester in which the qualifying exam will be taken. This course carries no credit, and the student incurs no fees. It provides a place in the student's official transcript to record when the qualifying exam was taken and the result.

Every student pursuing a PhD must pass a qualifying examination before becoming a candidate for the PhD. The qualifying examination consists of a six-hour written portion (generally given in two three-hour blocks on the same day), and an oral portion which may be given before or after the written portion. Both written and oral portions focus on fundamental and advanced civil engineering topics relevant to the student's specific program of study.

The oral portion may also explore specific skill areas required to conduct successful independent research. Students are deemed to have passed the examination based upon an overall evaluation of both the written and oral portions of the examination.

The qualifying examination is a pass/fail milestone in the PhD process. A letter indicating the result of each examination is placed in the student's graduate file. In rare cases, a student may be deemed to have conditionally passed the qualifying exam. This may occur when the student does extremely well in all but one area. Such a student must follow a prescribed plan to strengthen his or her knowledge and skills in the weak area and pass a special examination in the weak area within one calendar year. A student who conditionally passes the qualifying exam may register for dissertation credits and may form a Dissertation Committee.

While each student will take a different qualifying examination based upon an individual program of study, the exam is considered a departmental examination. All department faculty members in each civil engineering subdiscipline may participate in submitting written problems. Each student's academic advisory committee will review the entire exam before it is administered, and may suggest changes if it deems the examination, as presented, to be an inequitable test of the student's abilities. Recommendations on examination results are submitted by each student's Academic Advisory Committee. The departmental faculty, acting as a whole, votes to accept or reject such recommendations at a meeting scheduled for this purpose. Additionally:

1. 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.
2. A student may take the qualifying exam twice. A third attempt is permitted only with written permission from the Academic Advisory Committee and the approval of the department head. Under no circumstances may a student take the examination more than three times.
3. No student may register for CE 999X Dissertation credits until passing the qualifying exam.
4. A Dissertation Committee cannot be formed until the student passes the qualifying exam.
5. Any student who cannot pass the qualifying exam will be disqualified from the program.

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 his or her 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.

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.

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 semester of full-time study after passing the qualifying exam, or before 9 credits of dissertation credit are completed.

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 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 Committee. 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.

Computer Science, Ph.D.

Requirements for PhD in Computer Science

Summary

To receive a PhD in Computer Science at the NYU Tandon School of Engineering, a student must:

- satisfy a breadth course requirement, intended to ensure broad knowledge of computer science,
- satisfy a depth requirement, consisting of an oral qualifying exam presentation with a written report, to ensure the student's ability to do research,
- submit a written thesis proposal and make an oral presentation about the proposal,
- write a PhD thesis that must be approved by a dissertation guidance committee and present an oral thesis defense, and
- satisfy all requirements for the PhD degree, as described in the NYU Tandon School of Engineering bulletin, including graduate study duration, credit points, GPA, and time-to-degree requirements.

Upon entering the program, each student will be assigned an advisor who will guide them in formulating an individual study plan directing their course choice for the first two years. The department will hold an annual PhD Student Assessment Meeting, in which all PhD students will be formally reviewed.

1. Credits Requirements and Transfer Credits

In order to obtain a PhD degree, a student must complete a minimum of 75 credits of graduate work beyond the BS degree, including at least 21 credits of dissertation. A Master of Science in Computer Science may be transferred as 30 credits without taking individual courses into consideration. Other graduate coursework in Computer Science may be transferred on a course-by-course basis. Graduate coursework in areas other than Computer Science can be transferred on a course-by-course basis with approval of the PhD Committee (PHDC). The NYU Tandon School of Engineering places some limits on the number and types of transfer credits that are available. Applications for transfer credits must be submitted for consideration before the end of the first semester of matriculation. Further details can be found in the NYU Tandon School of Engineering bulletin.

2. Individual Study Plan

Each incoming PhD student will be assigned to a research advisor, or to an interim advisor, who will provide academic advising until the student has a research advisor. The advisor will meet with the student when the student enters the program to guide the student in formulating an Individual Study Plan. The purpose of the plan is to guide the student's course choice for the first two years in the program and to ensure that the student meets the breadth requirements. The plan may also specify additional courses to be taken by the student in order to acquire necessary background and expertise. Subsequent changes to the plan must be approved by the advisor.

3. Breadth Requirement

Each PhD student must complete a breadth requirement consisting of 6 courses. To remain in good academic standing, students must fulfill the breadth requirement within 24 months of entering the PhD program.

Students who do not fulfill the breadth requirement within 24 months will be dismissed from the program, unless an exception is granted by the PHDC. The PHDC will consult with the student's research advisor to decide whether an exception is granted and to determine the conditions the student needs to meet.

Details of Breadth Requirement

The courses used to fulfill the breadth requirement must satisfy the following:

(a) Approved list courses: At least 4 of the courses must be taken from the approved list of courses given in the appendix. The 4 courses must satisfy the following two requirements:

i) Theory requirement: At least one of the 4 courses must be taken in the Theory area.

ii) Systems & Applications Requirement: At least two of the 4 courses must be taken in Systems & Applications.

Exemptions from approved list courses: Students who have previously received a grade of A or A- in a graduate course similar to one on the approved list, while enrolled in a graduate program at a university with standards comparable to those at NYU, can use that course in lieu of taking the course on the approved list. The determination of whether a previously taken course can be used in this way will be made by the PHDC. However, any student who uses courses taken in another university to fulfill one or both of the Systems & Applications course requirements must work on a medium-size or larger software project at NYU. This project can be part of coursework or the student's research. A brief report on the project must be produced and approved by the PHDC.

Approved Course List: The list of approved courses will be reviewed regularly by the PHDC and is subject to change. Any changes must be approved by the CSE Department. In order for a course to be considered for inclusion in the list, the course must be rigorous and the students in it must be evaluated individually. Examples of inappropriate courses include those in which students are traditionally not differentially evaluated (e.g., all students receive A's or "pass") and courses in which grades are based on attendance or making a presentation of someone else's work, rather than on tests and assignments.

Students, under their advisors' guidance, should select their courses from the approved list so that they are exposed to a broad set of topics in computer science.

(b) Free choice courses: Students must take 2 free choice courses in addition to the 4 required courses from the approved list. Students can use any graduate course at NYU as free choice courses, but must obtain advisor approval to use a course not on the approved list. Students cannot use independent study courses (such as Advanced Project CS-GY 9963 or Readings in Computer Science, CS-GY 9413 and CS-GY 9423) or dissertation. No exemptions are available for free choice courses.

(c) GPA requirement: Students must receive a grade of at least B in each of the six courses used to fulfill the breadth requirement. The average in the 4 approved list courses used to fulfill the breadth requirement must be at least

3.5. (For students who receive exemptions allowing them to take fewer than 4 approved list courses, the average will be calculated over those courses.) The average in the 2 free choice courses must also be at least 3.5.

(d) Requirement for Students who have never taken an Algorithms Course: Any student who has not taken a course in Algorithms prior to entering the PhD program, at either the undergraduate or the graduate level, must take a graduate course in algorithms while in the PhD program. Students may take CS-GY 6033 (Design and Analysis of Algorithms I), CS-GY 6043 (Design and Analysis of Algorithms II), or CSCI-GA.3520 (Honors Analysis of Algorithms) to fulfill this requirement. The department may revise this list in the future depending on course offerings. Alternatively, students may petition the PHDC to use another course. The grade received in the course must be at least B.

4. Depth Requirement

By the end of a student's third semester in the program, at the latest, the student must be involved in a research project under the guidance of a faculty research advisor. It is the responsibility of each student to find a faculty advisor and a research project, and to inform the PHDC Chair about his/her choice of advisor. Students must inform the PHDC chair if they change their research advisor.

To satisfy the depth requirement, students must take a qualifying exam (QE) based on their research. The QE must be taken before the start of the student's fifth semester in the program. Students are required to form a QE committee, select an exam topic, and a tentative date approved by the advisor and committee, by the end of their third semester.

The QE committee must consist of the advisor and at least two other members. The committee must be approved by the advisor and the PHDC. The advisor is the designated chair of the committee. All members of the QE committee must be CSE faculty, faculty from other departments at NYU, or individuals of like standing from outside the university. At least two of the QE committee members must be tenured or tenure-track members of the CSE department, unless permission is obtained from the PHDC to include only one such member.

For the QE, the student must give an oral presentation of her/his research accomplishments to the QE committee and write a detailed document describing those accomplishments. The document must be submitted to the QE committee and the PHDC no later than one week before the oral presentation. A student is expected to have conducted original research by the time of the exam. This research may have been carried out independently or in collaboration with faculty, research staff, or other students. Students are encouraged, but not required, to have publication-worthy results by the time of the exam. It is not sufficient for a student to present a survey of previous work in an area or a reimplementation of algorithms, techniques, or systems developed by others.

The committee, by majority vote, gives a grade for the exam as one of "PhD Pass", "MS Pass", or "Fail." The chair of the QE committee will send this grade in writing to the student and to the PHDC chair, together with a written evaluation of the student's performance, approved by the QE committee members. A student who does not receive a "PhD pass" may request permission from the PHDC to retake the exam. The PHDC will consult with the QE committee, review the case and make the final decision as to whether a retake is allowed or not. A student may petition the PHDC to change one or more members of the QE committee, but approval of the request will be at the PHDC's discretion.

If the request for a retake is approved, the QE committee will determine the date for the second attempt. If the student is not allowed to retake the exam, the student will not be allowed to continue in the PhD program in the following semester. If the student does not pass the qualifying exam on the second attempt, or otherwise does not satisfy the conditions given to her/him upon failing the exam the first time, the student will not be allowed to continue in the PhD program in the following semester.

If a student has passed the QE and then changes his/her area of research, the student need not retake the QE.

Part-time students can petition the PHDC for extensions to the deadlines associated with the qualifying exam. Extensions should be for at most 2 semesters, except in extraordinary cases. Approval of extensions is at the discretion of the PHDC.

5. Thesis Proposal and Presentation

Within 6 months of passing the QE, each student is required to form a dissertation guidance committee. This committee must be approved by the student's research advisor and by the PHDC. The committee must include at least four members. The committee members can be CSE faculty, faculty from other departments at NYU, or individuals of like standing from outside the university. At least one member of the dissertation guidance committee must be a tenured or tenure-track CSE faculty member, and at least one member of the committee must be from outside the CSE department.

By the end of the student's fifth semester in the program, the student and committee must set a tentative date for the thesis proposal presentation. The presentation must be done prior to the start of the student's seventh semester in the program.

Before finalizing the date of the presentation, the student must submit a written thesis proposal to the dissertation guidance committee which should include:

- a description of the research topic
- an explanation of how the research will advance the state of the art, and
- a tentative research plan

After the dissertation guidance committee has approved the thesis proposal, the student should schedule the thesis proposal presentation and notify the PHDC chair once this has been finalized. The presentation should be announced to the faculty by the PHDC chair at least one week before it occurs. The presentation is open to all faculty. It may also be open to others at the discretion of the research advisor.

Substantial subsequent changes to the thesis topic must be approved by the dissertation guidance committee.

6. Thesis and Thesis Defense

The last, and most substantial, aspect of the PhD program is the dissertation. The research for the dissertation should be conducted in close consultation with the research advisor. When the adviser determines that the student is ready to defend the thesis, a dissertation defense will be scheduled. For the defense, the student will give an oral presentation describing the thesis research, which is open to the public. Following the oral presentation and an initial question and answer session, the dissertation committee and CSE faculty may ask the student further questions in closed session.

Other requirements for the PhD dissertation and defense can be obtained from the Office of the Associate Dean for Graduate Academics in the NYU Tandon School of Engineering.

7. Annual PhD Student Assessment Meeting

All Ph.D. students will be formally reviewed each year in a PhD Student Assessment Meeting. The review is conducted by the entire CSE faculty and includes at least the following items (in no particular order):

- All courses taken, grades received, and GPAs.
- Research productivity: publications, talks, software, systems, etc.
- Faculty input, especially from advisors and committee members.
- Student's own input.
- Cumulative history of the student's progress.

As a result of the review, each student will be placed in one of the following two categories, by vote of the faculty:

- In Good Standing: The student has performed well in the previous semester and may continue in the Ph.D. program for one more year, assuming satisfactory academic progress is maintained.

- Not in Good Standing: The student has not performed sufficiently well in the previous year. The consequences of not being in good standing will vary, and may include being placed on probation, losing RA/GA/TA funding, or not being allowed to continue in the PhD program.

Following the review, students will receive formal letters which will inform them of their standing. The letters may also make specific recommendations to the student as to what will be expected of them in the following year. A copy of each student's letter will be placed in the student's file.

8. NYU Tandon School of Engineering Requirements

Other requirements can be found in the NYU Tandon School of Engineering Bulletin. Students must meet all applicable requirements, including graduate study duration, credit points, GPA, and time-to-degree requirements.

Appendix

The following courses at NYU Tandon of Engineering can be used to satisfy the breadth requirements:

Theory

- CS-GY 6043 Design and Analysis of Algorithms II *3 Credits*
- CS-GY 6703 Computational Geometry *3 Credits*
- CS-GY 6753 Theory of Computation *3 Credits*

Systems & Applications

- CS-GY 6083 Principles of Database Systems *3 Credits*
- CS-GY 6093 Advanced Database Systems *3 Credits*
- CS-GY 6143 Computer Architecture II *3 Credits*
- CS-GY 6243 Operating Systems II *3 Credits*
- CS-GY 6253 Distributed Operating Systems *3 Credits*
- CS-GY 6313 Information Visualization *3 Credits*
- CS-GY 6413 Compiler Design and Construction *3 Credits*
- CS-GY 6513 Big Data *3 Credits*
- CS-GY 6533 Interactive Computer Graphics *3 Credits*
- CS-GY 6543 Human Computer Interaction *3 Credits*
- CS-GY 6553 Game Design *3 Credits*
- CS-GY 6613 Artificial Intelligence I *3 Credits*
- CS-GY 6823 Network Security *3 Credits*
- CS-GY 6843 Computer Networking *3 Credits*
- CS-GY 6913 Web Search Engines *3 Credits*
- CS-GY 6923 Machine Learning *3 Credits*
- CS-GY 6943 Artificial Intelligence for Games *3 Credits*
- CS-GY 9163 Application Security *3 Credits*
- CS-GY 9223 Selected Topics in Computer Science *3 Credits*
  Only the following topics are included:
- Social and Emotional Approaches to HCI

Note

The following courses, offered by the Computer Science Department at the Courant Institute of Mathematical Sciences at NYU, can also be used to satisfy the breadth requirements:

Theory

- CSCI-GA 3520 Honors Analysis of Algorithms

Systems & Applications

- CSCI-GA.2243 High Performance Computer Architecture
- CSCI-GA.2620 Networks and Distributed Systems
- CSCI-GA.3110 Honors Programming Languages
- CSCI-GA.3130 Honors Compilers
- CSCI-GA.3250 Honors Operating Systems
- CSCI-GA.2270 Computer Graphics
- CSCI-GA.2271 Computer Vision
- CSCI-GA.2434 Advanced Database Systems
- CSCI-GA.2560 Artificial Intelligence
- CSCI-GA.2565 Machine Learning
- CSCI-GA.2566 Foundations of Machine Learning
- CSCI-GA.2590 Natural Language Processing

Note

Students who began the program before Fall 2015 have the option of completing the requirements that were in effect at the time they began the program.

Students who began the program before Fall 2017 may count CS-GY 6903 Applied Cryptography as a breadth course in the Theory category, and CS-GY 6063 Software Engineering as a breadth course in the Systems and Applications Category.

Electrical and Computer Engineering, Ph.D.

Requirements for the Doctor of Philosophy

General

Graduate students who have exhibited a high degree of scholastic proficiency and have given evidence of ability for conducting independent research may consider extending their goals toward the doctorate. The Ph.D. degree is awarded after completing the program of study and research described below, and upon preparation and defense of a dissertation representing an original and significant contribution deemed worthy of publication in a recognized scientific or engineering journal.

Admission to Program

Students entering the doctoral program with a Bachelor's degree must meet the entrance requirements for the Master's program in the appropriate area of concentration. Students entering at the Master's level for the Ph.D. in Electrical Engineering program are normally expected to have a Master's in Electrical Engineering. Generally, admission to these Ph.D. programs is conditional on a student achieving a 3.5 grade point average in prior BS and MS programs. GRE is required for all applicants.

Thesis Advisor and Academic Advisor

Many factors enter into a student's choice of an advisor for his/her research. In addition to the scientific, intellectual and personality factors which influence the pairing of student and professor, financial aspects must also be considered. For most full-time students, the ideal situation is to find an advisor who has a research topic of mutual interest, as well as funds available from research grants and contracts which can support the student as a Research Assistant (RA). A prospective student is encouraged to contact faculty members in his/her research area regarding the possibility of advising before applying to the Ph.D. program. A student who joins the Ph.D. program without securing a thesis advisor will be assigned an academic advisor, who will guide the student in terms of course selection and research activities before the qualifying exam. A Ph.D. student candidate must obtain the commitment of a faculty member in the student's chosen area of major research interest to be the student's thesis advisor before taking the qualifying exam.

Usually, the thesis advisor is a full-time faculty member in the Electrical and Computer Engineering Department and as such is considered chair of the student's Guidance Committee. If a student wishes to have someone outside the ECE department to serve as his/her advisor, the student should submit the CV of the person and a letter of commitment from the person to serve as the advisor to the Ph.D. EE Program Director for approval. The thesis advisor must have a Ph.D. degree in the student's proposed area of research.

Qualifying Examination

A Ph.D. student (referred to as the student below) must pass the Ph.D. qualifying examination before the deadline to continue in the Ph.D. program and register for Ph.D. Dissertation Credits (ECE-GY 999x). The exam is an oral exam with content described below, but the student must have completed certain course and project requirements before taking the oral exam. Results of the exam will be recorded in the student's transcript as RE-GY 9990.Detailed information about the requirements to be satisfied before taking the qualifying exam including both course requirement, project scope and application process can be found in ECE graduate student manual, available under the ECE department webpage. Results of the exam will be recorded in the student's transcript as RE-GY 9990.

A. Requirements to be satisfied before taking the oral exam

1) The student must have registered at NYU-Tandon for at least one semester and taken at least 3 graduate-level courses and the student's cumulative GPA from formal courses (not including MS thesis, independent projects and readings) should be 3.5 or above.
2) The student must have completed at least 2 core courses (See Section on Course Requirement), with GPA over the core courses being 3.5 or above, and each core course earning a grade of B or above.
3) The student must have completed a research project under the supervision of a project advisor. The advisor can be any faculty member associated with ECE department. Notice that an external researcher may serve in this role, subject to approval by the chair of the ECE Graduate Curriculum and Standards Committee (to be referred to as the Graduate Committee subsequently). Examples of the project include, but are not limited to, an in-depth literature review of a certain topic, demonstrating solid understanding of a certain set of papers, or implementation and validation of some algorithms in past literature, or a study based on ideas initiated by the advisor or the student. Publication is not a requirement, but is encouraged if the student and the advisor find the contributions by the student worthy of publication. The project advisor should ensure that the project topic is appropriate for evaluating the student's potential for Ph.D. research. It is the student's responsibility to identify and secure a project advisor.
4) The student should have secured an ECE faculty member (or an external member approved by the Chair of the

Graduate Committee) prior to taking the qualify exam, who will serve as the student's Ph.D. advisor if the student passes the oral exam. The project advisor does not have to be the Ph.D. advisor. The prospective Ph.D. advisor is not obligated to provide financial support for the candidate. The advisor's letter of support must state a commitment of advising should the student pass the exam. It may also contain a narrative summarizing student's progress in the program.

B. Oral exam

1) The oral exam committee should include the prospective Ph.D. advisor, and three other faculty members chosen by the student in consultation with the Ph.D. advisor. The committee should have at least three Tandon ECE tenure or tenure track (T/TT) faculty (including advisor), the fourth one can be a faculty member or an industry/research professor (with Ph.D. in ECE. or a related area) from NYUAD, NYUSH, or any other NYU department. At most one member can attend the exam remotely if the member is at NYUAD or NYUSH. The student is responsible to secure the committee members to attend the oral exam and identify a time at which all committee members can attend. The exam should be scheduled for 1.5 hours to allow sufficient time for questions and answers and final discussion among the committee members. Once the schedule is fixed, the advisor should announce the exam to all ECE faculty and invite them to attend the exam.
2) A student must send in an official application, along with other required material, for taking the oral exam to the Ph.D. EE qualifying exam coordinator, at least two weeks before the target date of the oral exam. The application form can be downloaded from: http://engineering.nyu.edu/academics/departments/electrical/students/student-resources. The student must be registered for RE-GY 9990 at the time of the application. This zero-credit course is used for recording the exam results and follows the standard add/drop deadlines. A permission code for RE-GY should be requested from Prof. XK Chen with a copy to the student's advisor.
3) The student must submit a written project report to the exam committee at least one week before the exam date. The written report should be self-contained, and follows the standard format of a conference paper. It is recommended that the report size is between 4 - 6 pages in double column, font size 11.
4) During the exam, the student should give a 30-minute project presentation, followed by questions from the committee members, which should cover both the topic areas of the project and the foundational knowledge in the student's chosen research area. Each committee member (excluding the advisor) is expected to engage in about 15 minutes of questions and answers with the student, with a total of 45 minutes for questions and answers. The student may ask each committee member about from which area will the faculty member ask fundamental questions, although the faculty member is not obliged to provide a detailed answer.
5) The committee will provide a written evaluation of the student's potential for Ph.D. research to the department. The committee members can seek input from the prospective Ph.D. advisor when making such evaluation, but the advisor is excluded from participating in voting and writing the evaluation report. The evaluation criteria can be found from the evaluation form posted here: http://engineering.nyu.edu/academics/departments/electrical/student-resources
6) The ECE department will make the final decision of pass or fail based on the exam committee's recommendation. If the student and advisor intent is to take the dissertation credits ECE-GY 999X during the same term as the RE-GY 9990 qualifying exam, the exam committee's recommendation must reach the PhD qualifying exam coordinator at least a week in advance of the add/drop deadline for that term.
7) Result (Pass or fail) of the qualifying exam (RE9990) will be recorded in the student's transcript.
8) The student should prepare the report and the presentation independently, without the help from his/her advisor.
9) If a student wants to present a work described in a published, accepted or submitted paper of which the student is not the sole author, the student should submit a short report (2 pages) that is an extensive summary of the work, or a literature survey of the area, and his/her future work, written by the student only, to be submitted along with the paper.
10) The student can present a work that has been presented at a conference, but the presentation should be modified as necessary to fit the qualifying exam oral presentation time limit and provide sufficient background material. The modification should be done by the student independently, without the help of the advisor.

C. Time Limit and Timelines of the First and Repeat Oral Exams

1) Qualifying Exam Limit: It is important to note that students must pass the qualifying exam within 2 years of starting the PhD program or they can be dismissed from the PhD program. The 2 years is "academic years," i.e., fall/spring, fall/spring. In other words, the summer after the 2nd year is not included.

2) First Exam: For students (both full-time and part-time) who started the Ph.D. program with prior MS degree in electrical engineering or a related area, the first oral exam should be taken no later than one year after starting in the Ph.D. program. For students (both full-time and part-time) who started the Ph.D. program without a prior MS degree, the first oral exam can be taken either in the first year or the second year but the max of 2 years to pass the qualify still applies. If a student does not meet the requirement for taking the exam by this deadline, the student might be disqualified from the program.
3) Repeat Oral Exam and Disqualification: Students who failed the first oral exam but otherwise successfully meet the requirement for taking the oral exam can repeat the exam at most once, which should be completed within one year after the first exam. Students who fail to pass the repeat exam will be disqualified from the program.
4) Scheduling of First Exam and Repeat Exam: The first or repeat oral exam should be scheduled before a semester starts so that the student will be informed of the exam result on time for his or her course planning. A student who needs to repeat the qualify exam cannot repeat the exam in the same semester and must wait at least three months from the time when the first exam was taken.
5) More on the Repeat Exam: When a student is found to be deficient only in one part of the exam (e.g. written report, presentation of the project, answering fundamental questions), the student may be asked to repeat just that part of the exam. The repeat of a portion of the exam is treated the same as the repeat of the qualifying exam and is subject to the same deadline.

Course Requirements

1) Core Courses: A student, in consultation with and upon approval by the Ph.D. advisor, should choose at least 4 ECE-GY courses (12 credits) among courses with numbers ECE-GY6xxx, ECE-GY7xxx, ECE-GY8xxx, as their core courses. Transferred courses cannot be used to satisfy the core course requirement. To graduate, each course must have a grade of B or above and the average grade of the four courses must be 3.5 or above. The student must have completed at least 2 such courses with the average grade of taken courses being 3.5 or above, before taking the oral qualifying exam. The remaining core courses must be completed before graduation. The list of core courses a student (with a prior MS degree) will register for must be approved by his or her Ph.D. advisor.
2) ECE-GY courses: A student must choose at least 24 credits of ECE-GY courses, including the core courses. This requirement can be satisfied by the 30 credits transferred from a prior MS degree in electrical engineering or computer engineering.
3) Non-ECE Courses: A student must choose at least 2 non-ECE graduate-level courses (6 credits or more) that are in either Science or Engineering discipline. These courses should be chosen from areas that are distinct and yet consonant with the student's research area. Please note the courses in management cannot be counted towards this requirement. Courses taken at other schools of NYU will be counted towards this requirement provided that the PhD advisor approves them. Transferred courses taken at other accredited graduate programs are subject to approval by the Ph.D. EE program director.
4) Other courses: The degree requires a total of 75 credits with at least 21 Ph.D. dissertation credits taken at Tandon. A student must take a minimum of 42 credits in formal courses (as distinct from "independent study" credits such as reading, project or thesis), with a minimum of 24 course credits in ECE-GY courses. The student has freedom in choosing courses, provided that he or she satisfies the requirements specified in 1), 2) and 3). The student should consult with his/her Ph.D. advisor or academic advisor in devising a course plan as early as possible so that the course work covers sufficient depth for the student's chosen area of research and related field, as well as sufficient breadth. Note that credits from CS5000-level courses cannot be counted towards Ph.D. EE degree.
5) GPA requirement: As with all the graduate programs at NYU-Tandon, a student must maintain a GPA of 3.0 or above among all courses taken at NYU. A student with GPA below 3.0 has up to two semesters on probation. If at the end of the second semester on probation, the GPA is still below 3.0, the student will be disqualified from the program. The Ph.D. EE program further requires that a student must have a GPA of 3.5 or above among all formal courses (not including dissertation or other independent studies) taken at NYU to graduate, in addition to the GPA requirement for the core courses as specified in Item 1).
6) Internships: International students must register for an internship course to do an internship. Up to 6 credits of approved internships for Ph.D. (CP-GY 9941, CP-GY 9951, CP-GY 9961, CP-GY 9971, 1.5 credits each) can be applied towards the 75 credits Ph.D. degree requirement, and in particular, the ECE-GY course requirement as specified in Item 2) above. These credits can be part of the 45 credits beyond the 30 credits of a prior MS degree, which may include up to 3 credits of approved internships for MS (CP-GY 9911, CP-GY 9921). For an internship to be

approved for credits, the internship must provide training relevant to the student's research area. All internship must be approved and supervised by the student's Ph.D. advisor. The internship supervisor should submit a midterm and a final term evaluation report to the Ph.D. advisor. The student must submit a project report to the advisor upon completion of the internship for the evaluation and grading of the internship course.

Transfer Credits

For Ph.D. students with a prior MS degree, they are allowed to transfer up to 36 credits, of which 30 credits must be from their prior MS degree in ECE or a closely related field. For Ph.D. students admitted without a prior MS degree, they can transfer at most 6 credits. For the blanket transfer of 30 credits from a prior MS degree in ECE or a closely related field toward the PhD degree in EE, the student must provide a copy of his or her prior MS degree and the official academic transcripts. For individual course transfer, the student must provide an official transcript in a sealed envelope as well as catalog descriptions of the courses to be transferred, for evaluation and approval by the department graduate advisor. The official transcript and/or diploma submitted during the student's admission process can be used in place of new submission. Graduate courses taken at other schools of NYU or taken as an undergraduate student at NYU Tandon School of Engineering are exempt from this policy, but are subject to the general polity of the Tandon School of Engineering regarding such courses. This policy is effective for students entering in Spring 2018 and later.

Guidance Committee

On passing the qualifying examination, the student should consult with his or her thesis advisor to identify additional members and form a guidance committee. The committee should be composed of at least three members with the thesis advisor usually acting as Chairperson. If the dissertation advisor is not a tenured or tenure track (T/TT) Tandon faculty member of the Department, then a T/TT Tandon faculty member of the Department in the student's research area must be invited to serve as the Committee Chair. The committee should include at least two ECE T/TT faculty (including the advisor, and the NYUAD and NYUSH T/TT faculty), and may include at most two external members from outside the Department who are in the student's area of major research interest. The student must submit the names of the members of his or her Guidance Committee to the Office of Graduate Studies with a copy to the ECE Graduate Office within 6 months of passing the qualifying exam. The Guidance Committee conducts the area examination and thesis defense, and approves the final thesis. The Guidance Committee appointment form can be obtained from the Office of Graduate Studies.

Area Examination

In the area exam, the student reviews the prior research in the student's chosen dissertation topic and presents preliminary research results and additional research plan. The area exam is conducted by the Guidance Committee, but may be open to other interested faculty and students. The Guidance Committee attends and evaluates the student's performance and determines whether the student demonstrates the depth of knowledge and understanding necessary to carry out research in the chosen area. Results of the exam will be recorded in the student's transcript as ECE-GY 9980.

The student must submit a written report that summarizes prior research and the future plan at least one week before the scheduled exam time. The report should follow the Ph.D. dissertation template and be at least 25 pages long. The student must take and pass the area exam within 2 years after passing the Ph.D. qualifying exam. Students who fail to pass the exam by the deadline will be disqualified from the program.

The area exam evaluation form provides further details on the evaluation criterion for passing, and can be downloaded from: http://engineering.nyu.edu/academics/departments/electrical/student-resources

Registration for Ph.D. Dissertation Credits

After passing the qualifying exams, and with the agreement of the Thesis Advisor, the Ph.D. candidate may begin registration for dissertation credits ECE-GY 999x. (The student's failure to abide by this rule may result in loss of credit for the dissertation registration.) A student must register at least 3 credits for ECE-GY999x each semester. A minimum of 21 credits is required for the Ph.D. degree. The student must register for thesis continuously, every Fall and Spring semester, unless a Leave of Absence has been granted by the Office of Graduate Studies.

Submission of the Thesis and Thesis Defense

Upon completion of the doctoral dissertation, the candidate undergoes an oral thesis defense. The defense is conducted by the Guidance Committee, but is open to all members of the ECE faculty and other invited people. The student must submit a complete draft of the dissertation to the Guidance Committee members at least one week before the scheduled defense. The student should consult the Office of Graduate Studies regarding how to submit, reproduce and bind the final manuscript.

Seminar Attendance Requirement

Ph.D. students are required to register for a 0-credit Research Seminar course (ECE-GY 9900) for at least 4 semesters. Satisfactory grade is given only if the student attends more than 2/3 of the seminars offered in a semester. Part-time students who have difficulty attending the seminar because of work conflict may be exempted from this requirement upon approval of the Ph.D. EE program director. The student should submit the approval note when applying for graduation.

Publication Requirement

To be granted the Ph.D. degree, a Ph.D. candidate must either have a peer-reviewed journal paper (accepted or published), or have at least one paper under review by a peer-reviewed journal on the thesis research subject.

For the journal paper(s), a letter of acceptance by a journal, or a letter of submission to a peer-reviewed journal along with acknowledgment of its receipt by the journal, will constitute the required evidence. If there is no accepted/published journal paper, the student should have at least one accepted conference paper that appeared in the proceedings of a peer-reviewed conference.

Requirements for Students Entered Before Fall 2014

Students who entered before Fall 2014 can either follow the requirements described above, or the requirement effective at the time of matriculation. The requirements posted in the NYU-Tandon catalog as of Sept. 2013 differ from the new requirements in the following aspects. For a complete description, please consult the ECE Graduate Student Manual published in Spring 2013.

Course and Thesis Requirements: A minimum of 75 credits of academic work beyond the bachelor's degree, including a minimum of 21 credits of NYU-Tandon dissertation research, is required. A minimum of 42 credits in formal courses (as distinct from independent study credits such as reading, project or thesis) are required. A student entering with a MS from a reputable graduate program may transfer 30 credits. PhD students are required to take a minimum of 9 credits of courses in a minor area outside of electrical engineering. The minor must be taken in an area that is both distinct from and yet consonant with the student's major study area. Students work with thesis advisers to develop their major study program. The major program should constitute a coherent, in-depth study of the most advanced knowledge in the student's area of concentration.

Publication Requirement: To be granted the PhD degree, a PhD candidate must have at least one accepted or submitted journal paper on the thesis-research subject.

Transfer credits: For Ph.D. students entered before Spring 2015, the following policy as stated in the NYU-Tandon catalog as of Sept. 2013 are applicable: Doctoral candidates may transfer a maximum of 48 credits, including a 30-credit blanket transfer from a prior MS degree in Electrical Engineering or a closely related field, and additional courses in Science and Engineering not included in the prior MS that are individually transferred. For the blanket 30-credit transfer, the prior MS need not be a 30-credit MS, so long as an MS degree (or equivalent) was granted, and a copy of the degree and detailed transcripts are presented. Additional courses individually transferred cannot include project, thesis, dissertation, guided studies or readings, or special topics credits. Applications for transfer credits must be submitted for consideration before the end of the first semester of matriculation. The student's major academic department evaluates graduate transfer credits, but no courses with grades less than B will be considered.

PhD Time Limits: The PhD time clock begins at the time of enrollment in the PhD program. Full-time PhD students who have completed an MS degree or who transfer 24 or more graduate credits towards their PhD degree must complete their PhD degree requirements within six years from the beginning of their PhD studies. Full-time PhD students who transfer in or have completed fewer than 24 credits when they begin their PhD studies have a maximum of seven years to complete their PhD. Part-time PhD students must complete their PhD degree requirements within nine years from the beginning of their PhD studies. Approved leave of absence will stop the time clock.

Graduate Manual:

For further information, please refer to the graduate manual, which can be found on the student resources page: https://engineering.nyu.edu/academics/departments/electrical-and-computer-engineering/student-resources

Materials Chemistry, Ph.D.

Requirements for the Doctor of Philosophy

Each doctoral candidate must complete a minimum of 75 credits of academic work past the bachelor's degree, including a minimum of 36 credits of dissertation research, to complete the PhD in Materials Chemistry program. A minimum of 30 graduate credits beyond the bachelor's degree (not including PhD dissertation and non-dissertation research credits) are required in chemistry or related subjects. Of the 30 credits, 12 are to be taken as part of the required graduate core courses in Materials Chemistry, 6 are from student seminars and a chemical information course, and 12 are taken as electives. For electives: at least 2 electives (6 credits) are to be chosen from approved CM courses, 6000-level and above. The remaining electives need to be selected in consultation with and with an explicit approval from the materials chemistry graduate adviser. In addition to the required coursework, attendance is required at departmental colloquia.

Students must also pass a comprehensive qualifying examination in materials chemistry and present a doctoral dissertation. The qualifying exam is given once a year. Additional details on the qualifying examination will be provided by the graduate adviser.

To meet graduation requirements, students must have an overall GPA of 3.0 or higher, excluding dissertation credits, and must not obtain a grade of C or lower in more than two required core courses.

A student who has earned graduate level credits and/or been awarded an MS degree should consult with the graduate adviser for course registration and possible credit transfer.

Candidates for the degree Doctor of Philosophy in Materials Chemistry should plan their programs in accordance with the following requirements:

Required Core Subjects: 12 credits, 3 credits each

- CM-GY 7043 Statistical Thermodynamics and Kinetics *3 Credits*
- CM-GY 9033 Physical Organic Chemistry *3 Credits*
- CM-GY 8023 Principles of Spectroscopy *3 Credits* OR CM-GY 8073 Organic Spectroscopy *3 Credits*
- CM-GY 6013 Advanced Inorganic Chemistry *3 Credits* OR CM-GY 9413 Biochemistry I *3 Credits* OR CM-GY 7723 Synthesis of Macromolecules *3 Credits*

Other Required Subjects: 6 credits, 1.5 credits each

- CM-GY 9731 Seminar in Chemistry I *1.5 Credits*
- CM-GY 9741 Seminar in Chemistry II *1.5 Credits*
- CM-GY 9751 Seminar in Chemistry III *1.5 Credits*
- CM-GY 5021 Information Sources for the Chemical Sciences *1.5 Credits*

Electives: 12 Credits

At least two electives (6 credits) must be chosen from approved CM courses, 6000-level and above.

The remaining courses may be chosen from other graduate programs with the approval of the graduate adviser in Materials Chemistry.

Dissertation: 36 Credits

- CM-GY 999X PhD Dissertation in Materials Chemistry *36 Total Credits*

Note:

Up to 9 credits of CM-GY 998X Research in Materials Chemistry can be included here.

Total: 75 Credits

Additional Requirements:

- **Required safety training:** All graduate students in PhD Materials Chemistry must enroll in (on BioRaft) and complete three one-hour training sessions offered by the NYU EHS (Environmental Health and Safety) Office in the first semester. The three sessions are: Lab Safety, Waste Management and Biosafety. Student must show proof (e.g. certificate) that they completed this training to their advisors. Each subsequent fall they must take three online refresher sessions until they graduate.
- CM-GY 9710 Chemical Colloquium *0 Credits* must be taken each semester.

Mechanical Engineering, Ph.D.

Requirements for the Doctor of Philosophy

The PhD is a terminal degree beyond the MS and focuses on engineering research. Students are expected to advance the state of the art in their specialty by original and creative work. A MS in Mechanical or Aerospace Engineering or other closely related engineering or applied sciences fields is required for admission to the PhD degree program. A 3.5 GPA or better in the MS work is generally required for admission. In cases where it is unclear that the required MS specialization has been satisfied, the MS degree requirements of the preceding section will define the necessary reparation. The same criterion is used when the MS degree is in other engineering disciplines. Students with a BS degree in Mechanical or Aerospace Engineering and a GPA of 3.5 or better may apply directly for admission to the PhD program. Students have to take a written and oral departmental qualifying examination within the first two offerings of the exam after the date they join the doctoral program.

The general credit requirements for the PhD degree (beyond the BS degree and including MS degree credits) are:

	Credits
Transfer from MS degree	30
Approved course work beyond the MS degree	18 (minimum)
PhD Dissertation (ME-GY 999X)	21 (minimum)
Minimum total required	75 (minimum)

Studies for the PhD degree must be completed in five years after the MS degree or the date of admission, whichever is later, unless a formal leave of absence is approved before the period for which the studies are interrupted.

Once the dissertation is begun (after the student passes the PhD Qualifying Exam and forms a PhD Guidance Committee), the student must register for at least 3 credits of ME-GY 999X PhD Dissertation in Mechanical Engineering each fall and spring semester. Actual registration should reflect the pace of the work and the activity of the student. An exception to the minimum registration requirement may be made in the last semester of registration if that semester is devoted primarily to complete the work and dissertation. A dissertation grade of U for two consecutive terms affects whether a student will be permitted to continue doctoral work. Students are required to present the progress in their dissertation work to their guidance committees at least once a year.

Details on the PhD degree requirements and additional requirements can be found in the departmental pamphlet on the topic.

Contact Information:

Departmental Advisers:

Iskender Sahin, iskender.sahin@nyu.edu

Maurizio Porfiri, mporfiri@nyu.edu

Technology, Culture and Society Ph.D.

Degree Requirements and Curriculum

The curriculum for the Ph.D. in Technology, Culture and Society Program fosters a research-intensive doctoral education relevant to understanding and shaping the impact of new technologies on a complex and rapidly-changing society and its institutions. We focus on how technology impacts society and culture and how, in turn, society and its institutions respond to those impacts. This includes the rapidly emerging areas of integrated design media, human-computer interaction, institutional innovation, data science and urban analytics. TCS core courses provide a necessary foundation to develop these advanced skills.

Coursework for the Ph.D. in Technology, Culture, and Society expose students to advanced design skills modulated by understanding of the ways in which society and technology deeply influence design and development. Research methods courses help students develop advanced qualitative and quantitative research skills in the social sciences, as a basis for designing, making, and evaluating new technologies in the service of society. Thematic elective courses help students gain in-depth knowledge in a focused thematic area related to designing and making in domains including Human-Computer Interaction, disability, media, and governance based on grassroots input, as well as a deep intersectional understanding of the interplay between technology, race, class, gender, and ability. Working together, students and doctoral advisers select which courses relate to the student's course of study in the Program.

Students are required to complete 75 credits, including 51 credits from the course work and 24 credits from the dissertation.

1. Research Methods Courses: 9 Credits

- MG-GY 9413 Quantitative Methods Seminar I *3 Credits*
- MG-GY 9433 Qualitative Research Methods *3 Credits*
- Methodology course related to student's plan of study (requires advisor and program director approval)

2. TCS Courses: 15 Credits

Students will have the opportunity to hone their specialization through selecting TCS courses relevant to their research interests. Students should consult with their research advisor and select 5 appropriate classes).

- Can be in any subfield(s)
- At least 3 courses must be offered through TCS department

3. Doctoral Seminar (12 Credits)

Students are required to take four 3-credit doctoral seminar courses to provide strong research background required for doctoral studies. These four research seminars should be completed before taking the comprehensive exam.

DM-GY Doctoral Seminar in Technology, Culture and Society

4. Independent Research Project: 15 Credits

Students will build their research experience through independent study courses where they will conduct research under a faculty member. Students must complete at least 15 credits of this course before registering for their dissertation, and enroll with at least two different TCS faculty.

- MG-GY 9913 Independent Research *3 Credits*

5. Doctoral Dissertation: 24 credits

The dissertation is evaluated in two parts: Proposal Defense and Final Defense. For details, contact the Ph.D.-TCS Program academic director.

- MG-GY 999X PhD Dissertation in Technology Management *3 Credits*

6. Comprehensive Examinations

Students must successfully pass two comprehensive examinations before starting the dissertation.

- Part One: This examination includes material covered in the methodology courses. It can be taken after completing 30 graduate credits.
- Part Two: This examination includes material from the thematic elective and associated thematic research courses, doctoral seminars and research methods courses. It can be taken after completing required course work.

Students can take both examinations together. Results are provided within one month of the examination. Students have only two chances to pass each examination, and we recommend they start during the end of their 2^{nd} year.

7. Research training and interaction with faculty

Students are expected to work actively with one or more faculty each year, and focus on completing research. Students are strongly encouraged to present research in progress once a year and work towards publishable papers, usually with a faculty as co-author.

Every student participates in formal research seminars with departmental faculty and visitors.

8. Advising and evaluating

The TCS doctoral program faculty director advises all first-year doctoral students. During their first year students have many opportunities to get to know the research interests of all departmental faculty. By the beginning of the second year, students have selected an intermediary adviser who will guide them through the comprehensive exam process and up to the thesis stage. By the middle of the third year students will have selected a thesis adviser. Each year every student submits a statement of intellectual progress to their adviser.

All faculty meet to review the progress of all students in a day-long meeting each year. At this time, the student's intellectual progress is reviewed and plans for the following year are considered. The results of this review include a formal letter to the student assessing the previous year's work and offering guidance for the following year's work.

9. Prerequisites

All PhD-TCS students need a fundamental knowledge of probability and statistics. Students without such a background must take MG-GY 5050 Probability and Managerial Statistics. Students without any background in professional writing and communications must take JW-GY 6003 Introduction to Technical Communication or JW 6313 Proposal Writing.

Students who have a master's degree or who are transferring from other institutions (or other departments within Tandon) are admitted based on the same qualification standards that apply to new students. For each required MS- or PhD-level course, if students have taken a similar course, they may transfer credits for the course. However, students still have to take and pass both qualifying exams. A minimum of 30 credits, including all dissertation credit, must be taken at Tandon. No dissertation credits from other institutions can be transferred.

All students must take the required coursework as assigned and follow the stipulated curriculum. The course work must be finished within the first three years and the dissertation thesis within the next three years, so all students complete the doctorate within six years.

Total Credits for PhD-TCS Program: 75

Transportation Planning and Engineering, Ph.D.

Doctor of Philosophy in Transportation Planning and Engineering

The PhD in Transportation is a research-oriented degree intended for those whose goal is a career in basic transportation research and/or teaching at the Institute level or in private research organizations.

Goals and Objectives

The fundamental goal of the PhD in Transportation Planning and Engineering is to develop professionals with strong research skills capable of advancing the profession of transportation planning and engineering through their work. Specific objectives of the program are to provide the skills necessary to:

- develop a strong and deep fundamental knowledge about the profession of transportation planning and engineering;
- develop the knowledge and skills to perform independent fundamental research in transportation planning and engineering;
- produce fundamental research that meaningfully advances the state-of-the-art of the profession of transportation planning and engineering.

Program Requirements

Students pursuing the PhD in Transportation Planning and Engineering generally specialize in one of the following subject areas:

- Transportation planning
- Traffic engineering
- Intelligent transportation systems
- Transportation safety

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

Program Administration

All graduate applications are processed through the civil engineering departmental office, which distributes applications to the graduate coordinator. Graduate program coordinators formally implement admission decisions, in accordance with departmental regulations.

The graduate coordinators consult with the departmental Graduate Committee. All PhD applications are reviewed by the committee, and admissions decisions are made by the committee and implemented by the graduate coordinator.

For each registration, the student's program must be approved by their individual academic adviser .

Admission Criteria to PhD Program

Admission to the PhD in Transportation Planning and Engineering requires an MS in Transportation Planning and Engineering or equivalent, with a GPA of 3.5 or better (on a 0-4 scale).

All applicants are required to submit GRE scores for consideration. Foreign applicants must take the TOEFL examination and submit the results for consideration.

The "equivalent" of the MS degree can be achieved in several ways. The candidate may have an MS degree with a different title that covers substantially the same material. More generally, applicants must demonstrate that they have the equivalent of all undergraduate and master's level course work in order to pursue doctoral level work in the major area. Further, "equivalence" is evaluated based on the totality of the student's undergraduate and graduate record, not course-by-course.

Because admission to a PhD program requires a related MS (or equivalent), those applicants who have not yet achieved a master's degree would normally be admitted as MS students. They are expected to earn an MS degree while completing their major and minor course requirements. In rare cases, an applicant with only a BS degree may be directly admitted into the PhD program with the written approval of the department head and will be required to take all courses needed for the MS degree with an overall GPA of 3.5.

Doctoral Committees

Upon admission, every PhD student is assigned an academic adviser, who is selected by the PhD committee. Any member of the civil engineering faculty can be an academic adviser to a graduate student. In cases where a student is supported on a research contract, the principal investigator of the contract would normally be appointed as the academic adviser for the student. Where a student has a particular research interest and is working with a particular faculty member, the student may request that the faculty member be appointed as academic adviser. In rare cases where 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 transportation program.

In fulfilling their academic requirements, PhD candidates will deal with two advisory committees:

Academic Advisory Committee: The student's academic adviser works out a program of courses to fulfill major and minor requirements for the PhD. The Academic Advisory Committee generally will comprise the academic adviser and one faculty member for each 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.

Dissertation Committee: The Dissertation Committee is formed immediately after the student passes the qualifying examination. It comprises a major adviser, a dissertation adviser and a minor adviser for each minor the student has pursued. Additional faculty members may also be on the Dissertation Committee. The Dissertation Committee may be the same as the Academic Advisory Committee, or may be different. The Dissertation Committee guides the student's course and research work after the student has passed the qualifying examination. The Dissertation Committee must be formally assigned and approved by the department head and filed with the Office of Graduate Academics. The major adviser must be a fulltime faculty member of the Department of Civil and Urban Engineering. The major and dissertation adviser may be the same individual.

Doctoral Degree Requirements

To earn a PhD in Transportation Planning and Engineering, the following requirements must be met:

- Fifty-one credits of graduate 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 3.5 or better on a 0-4 scale).
- Completion and successful defense of a 24-credit dissertation related to the major area of study. Dissertations must consist of original research that meaningfully advances the state-of-art in the subject area of the research 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.
- Completion of two minor areas of study, each consisting of between 9 and 12 credits of graduate work.
- Residency requirements for the PhD in Transportation Planning and Engineering include the 24-credit dissertation. The dissertation advisor has to approve all transferred credits from other institutions.

In satisfying the 51-credit course requirement, the student must satisfy all requirements for the major and minor areas selected, or their equivalent.

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

- Thirty-nine credits of approved graduate course work, not including individual guided studies (readings, projects, theses, etc.) beyond the bachelor's degree, with a cumulative average of 3.5 or better on a 0-4 scale.
- Twenty-one credits of related graduate course work beyond the master's degree, with a cumulative average of 3.5 or better on a 0-4 scale.

Satisfying condition 2 requires that the department accept the student's MS degree *in toto* without regard to its specific content. This requires a recommendation from the department's Graduate Committee and the approval of the department head.

Transfer Credits

Transfer credits for PhD students can be awarded course by course. Alternatively, a MS degree from another institution may be accepted for transfer in toto. The latter requires a recommendation from the department's Graduate Committee and the approval of the department head. Transfer credits are awarded generally at the time of admission and must be approved by the academic adviser, the transportation graduate coordinator and the department head.

Qualifying Examination

Departmental qualifying examinations for the PhD in Transportation Planning and Engineering are given once a year (usually in May or June) and are coordinated with other qualifying examinations in the department. If sufficient demand exists, a second qualifying examination may be scheduled in November or December. Every PhD student must pass a qualifying examination in the major area of study and in any in-department minor areas of study before becoming a candidate for the PhD. Further:

- No student may register for dissertation credits until the Qualifying Examination is passed.
- A Dissertation Committee cannot be formed until the student passes the Qualifying Examination.
- A student may take the Qualifying Examination twice. A third attempt is permitted only with the written recommendation of the Academic Advisory Committee and the approval of department head. In no case may a student take the examination more than three times.
- Students normally take the Qualifying Examination (for the first time) after successfully completing most of their course requirements in the major and in department minor areas of study.

The Qualifying Examination consists of a five-hour written portion and an oral portion of approximately one hour. Both written and oral portions of the examination focus on the student's major and in-department minor. The oral portion may also explore higher-level skill areas required to successfully conduct independent research. Students are deemedto have passed the examination based upon an overall evaluation of the written and oral results. While some students may not be invited to the oral examination if they have done poorly in the written portion, invitation to the orals does not imply that the student has "passed" the written portion of the exam.

The Qualifying Examination is either "passed" or "failed." A letter indicating the result of each examination is placed in the student's graduate file. In rare cases, a student may be deemed to have "conditionally passed" the Qualifying Examination. This conditional status occurs in cases where the student does extremely well in all areas except for a single subject area in which weakness has been noted. Such students must follow a prescribed plan to strengthen their knowledge and skills in the area of weakness and must pass a special examination on the area of weakness within one calendar year. A student who has "conditionally passed" the Qualifying Examination may register for dissertation credits and may form a Dissertation Committee.

All transportation faculty members participate in submitting written problems for the qualifying examination, and in the grading process and in the oral examination. All departmental faculty members are welcome to observe any oral examination and to ask pertinent questions. Each student's Academic Advisory Committee will have the opportunity to review the entire exam before it is administered and may suggest changes if it deems that the examination as presented is an inequitable test of the student's abilities. Recommendations on the results of the examination are submitted by each student's Academic Advisory Committee, augmented by any departmental faculty in the subdisciplines tested.

Dissertation Proposal

Following passage of the Qualifying Examination 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 between 15 and 20 pages long and should address the following specific items:

- Description of the topic
- Literature review sufficient to insure that the work contemplated is original
- Research methodology(ies) to be used
- Data and/or laboratory needs and their availability to the student
- Anticipated outcomes

The Dissertation Proposal must be submitted after one semester of registering full time for dissertation credits, or before 9 credits of dissertation credit are completed.

The Dissertation Proposal is orally presented 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 made available to department faculty at least two weeks (14 calendar days) before the defense.

When the Dissertation Proposal is formally accepted, the Dissertation Adviser enters a letter into the student's graduate file, indicating this acceptance, with a copy of the proposal. While the Dissertation Committee has reasonable flexibility to modify the proposal during the research, any significant change in focus area or methodology requires that an amended Dissertation Proposal be written and formally accepted following the same procedure noted 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 Committee has reviewed the draft dissertation and determined that it is complete and of sufficient quality to be presented and defended. By this time, it is also required that a paper based on the dissertation has been submitted to a peer-reviewed journal for publication, details to be worked out with the dissertation advisor.

The defense is organized and scheduled by the Dissertation Committee. All Institute faculty members are invited to observe and ask questions at all NYU Tandon 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 requesting one in a timely fashion and in no case less than two weeks before the defense.

Course Descriptions

A Brief Guide to Course Descriptions

Each program described in this catalog contains detailed descriptions of the courses offered within the program.

The first line gives the official course number for which students must register and the official course title. The letters indicate the discipline of the course and the first number of the official course numbers indicates the level of the course. The levels are as follows:

- 1XXX - Freshman Level
- 2XXX - Sophomore Level
- 3XXX - Junior Level
- 4XXX - Senior Level
- 5XXX to 9XXX - Graduate level

Typically the last number of the course number indicates the number of credits. The breakdown of periods of the course is also listed.

When selecting a course for registration, the section of the course may include the following notations:

- "LEC" - lecture section
- "RCT" or "RC" - recitation section
- "LAB" or "LB" - lab section

Additionally, any other letter or digit listed in the section will further identify the section and being liked to another section of the class with the same letter and/or digit combination. Further information on sections is available from academic advisers during registration periods.

The paragraph description briefly indicates the contents and coverage of the course. A detailed course syllabus may be available by request from the office of the offering department.

“Prerequisites” are courses (or their equivalents) that must be completed before registering for the described course. “Co-requisites” are courses taken concurrently with the described course.

The notation “Also listed…” indicates that the course is also given under the number shown. This means that two or more departments or programs sponsor the described course and that students may register under either number, usually the one representing the student’s major program. Classes are jointly delivered.

Aerospace Engineering

AE-UY 4603 Compressible Flow

AE-UY 4613 Aerodynamics

AE-UY 4633 Aerospace Propulsion

AE-UY 4653 Aircraft Flight Mechanics

Art History

AH-UY 2114 History of Art as Techné

AH-UY 3214 Contemporary Art, Electronic Art and Technology

AH-UY 4911 Special Topics in Art History

AH-UY 4912 Special Topics in Art History

AH-UY 4913 Special Topics in Art History

Biomedical Engineering

Graduate Courses

Course descriptions of biomedical engineering courses, as well as CM and CBE courses associated with the MS in Biomedical Engineering Program, are given below. Other courses that are not described below are listed in the Biomedical Engineering Program and can be found in the course descriptions by their departments elsewhere in this catalog.

BE-GY 871x Guided Studies in Biomedical Engineering

BE-GY 873x Research in Biomedical Engineering

BE-GY 997x MS Thesis in Biomedical Engineering

BE-GY 999X PhD Thesis Research in Biomedical Engineering

BE-GY 6013 Molecular Immunology

BE-GY 6023 Cellular and Molecular Neuroscience

BE-GY 6103 Anatomy, Physiology and Biophysics I

BE-GY 6113 Anatomy, Physiology and Biophysics II

BE-GY 6203 Medical Imaging I

BE-GY 6213 Biomedical Imaging II

BE-GY 6303 Bio-optics

BE-GY 6353 Special Topics in Biomedical Engineering

BE-GY 6403 Digital Signal Processing I

BE-GY 6453 Probability and Stochastic Processes

BE-GY 6463 Biostatistics for Biomedical Engineers

BE-GY 6483 Digital Signal Processing Laboratory

BE-GY 6503 Bioinstrumentation

BE-GY 6601 Introduction to Drug Delivery

BE-GY 6603 Drug Delivery

BE-GY 6653 Principles of Chemical and Biochemical Systems

BE-GY 6723 Natural Polymers and Materials

BE-GY 6753 Biomechanics and Biomaterials in Orthopaedics

BE-GY 6803 Biomaterials: Engineering Principles and Design Considerations

BE-GY 9433 Protein Engineering

BE-GY 9443 Tissue Engineering

BE-GY 9730 Colloquium in Biomedical Engineering

BE-GY 9740 Seminar in Biomedical Engineering

BE-GY 9753 Bioethics Seminar

Bioinformatics

BI-GY 997X MS Thesis in Bioinformatics

BI-GY 7453 Algorithms and Data Structures for Bioinformatics

BI-GY 7513 Chemical Foundation for Bioinformatics

BI-GY 7523 Biological Foundation for Bioinformatics

BI-GY 7533 Bioinformatics I: Sequence Analysis

BI-GY 7543 Proteomics

BI-GY 7553 Bioinformatics III: Functional Prediction

BI-GY 7563 Chemoinformatics

BI-GY 7573 Special Topics in Informatics in Chemical and Biological Sciences

BI-GY 7583 Guided Studies in Bioinformatics I

BI-GY 7593 Guided Studies in Bioinformatics II

BI-GY 7613 Introduction to Systems Biology

BI-GY 7623 Systems Biology: -Omes and –Omics

BI-GY 7633 Transcriptomics

BI-GY 7643 Computational Tools: Perl & Bioperl

BI-GY 7653 Next Generation Sequence Analysis

BI-GY 7663 Problem Solving For Bioinformatics

BI-GY 7673 Applied Biostatistics for Bioinformatics

BI-GY 7683 Biology and Biotechnology for Bioinformatics

BI-GY 7693 Population Genetics and Evolutionary Biology

BI-GY 7723 Statistics and Mathematics for Bioinformatics

BI-GY 7733 Translational Genomics and Computational Biology

BI-GY 7743 Machine Learning and Data Science for Bioinformatics

BI-GY 7843 Molecular Modeling and Simulation

GSAS Biology

BIOL-GA 2030 Statistics in Biology

BIOL-GA 2303 Introduction to Biostatistics

Biomolecular Science

BMS-GY 8011 Advanced Molecular Biology Laboratory

BMS-GY 8013 Advanced Molecular Biology

BMS-GY 8021 Advanced Cell Biology Laboratory

BMS-GY 8023 Advanced Cell Biology

BMS-UY 471X Guided Studies in Biomolecular Science

BMS-UY 1001 Introduction to Cell and Molecular Biology Laboratory

BMS-UY 1003 Introduction to Cell and Molecular Biology

BMS-UY 1004 Introduction to Cell and Molecular Biology

BMS-UY 1032 Introduction to Biomolecular Science

BMS-UY 2001 Introduction to Physiology Laboratory

BMS-UY 2003 Introduction to Physiology

BMS-UY 2004 Introduction to Physiology

BMS-UY 2612 Stem Cells and Development

BMS-UY 3114 Genetics

BMS-UY 3214 Microbiology

BMS-UY 3513 Biostatistics

BMS-UY 3514 Organismal Physiology

BMS-UY 3614 Advanced Molecular Biology

BMS-UY 3714 Advanced Cell Biology

BMS-UY 4011 Senior Seminar

BMS-UY 4314 Advanced Cell Physiology

BMS-UY 4414 Biophysics

BMS-UY 4811 Topics in Biology

BMS-UY 4812 Topics in Biology

BMS-UY 4813 Topics in Biology

BMS-UY 4814 Topics in Biology

BMS-UY 4824 Topics in Biology

BMS-UY 4834 Topics in Biology

BMS-UY 4844 Topics in Biology

BMS-UY 4914 Undergraduate Research in Biomolecular Science

BMS-UY 4924 Undergraduate Research in Biomolecular Science

BMS-UY 4934 Life Science Internship

GSAS BMSC

BMSC-GA 4404 Fundamental concepts of MRI

BMSC-GA 4409 Advanced MRI

BMSC-GA 4427 Practical MRI I

BMSC-GA 4428 Practical MRI II

BMSC-GA 4469 Positron Emission Tomography

Biotechnology

BE-GY 6253 Biosensors

BT-GY 871X Project in Biotechnology

BT-GY 6013 Biotechnology and the Pharmaceutical Industry

BT-GY 6023 Biotechnology and Health Care

BT-GY 6033 Biosensors and Biochips

BT-GY 6043 Biocatalysis in Industry

BT-GY 6053 Introduction to Neuroscience for Biotechnologists

BT-GY 6063 Molecular Immunology

BT-GY 6073 Genetic Engineering

BT-GY 6083 Advanced Cell and Molecular Biology

BT-GY 6093 Biomedical Materials & Devices for Human Body Repair

BT-GY 7011 Special Topics in Biotechnology

BT-GY 7013 Special Topics in Biotechnology

BT-GY 7033 Business Concepts for the Biotechnology Entrepreneur

BT-GY 7043 Computer-Aided Protein and Drug Design

BT-GY 8713 Guided Studies in Biotechnology I

BT-GY 8723 Project in Biotechnology

BT-GY 9053 Enzyme Catalysis in Organic Synthesis

BT-GY 9433 Protein Engineering

BT-GY 9443 Tissue Engineering

Biotechnology and Entreneurship

BTE-GY 950x Project in Biotechnology and Entrepreneurship

BTE-GY 6013 Biotechnology and the Pharmaceutical Industry

BTE-GY 6023 Biotechnology and Health Care

BTE-GY 6033 Biosensors and Biochips

BTE-GY 6043 Biocatalysis in Industry

BTE-GY 9513 Project in Biotechnology and Entrepreneurship

BTE-GY 9523 Project in Biotechnology and Entrepreneurship

Career Management

CP-GY 9911 Internship for MS I

CP-GY 9921 Internship for MS II

CP-GY 9941 Internship for PhD I

CP-GY 9951 Internship for PhD II

CP-GY 9961 Internship for PhD III

CP-GY 9971 Internship for PhD IV

CP-UY 2002G Experiential Learning Seminar

CP-UY 2011 Internship for BS I

CP-UY 2013 Undergraduate Internship I

CP-UY 2021 Internship for BS II

CP-UY 2023 Undergraduate Internship II

CP-UY 2340 Undergraduate Summer Research Program

Chemical and Biomolecular Engineering

CBE-GY 902X Guided Studies in Chemical Engineering

CBE-GY 997X MS Thesis in Chemical & Biological Engineering

CBE-GY 998X Research in Chemical & Biomolecular Engineering

CBE-GY 999X PhD Dissertation in Chemical & Biological Engineering

CBE-GY 6153 Applied Mathematics in Engineering

CBE-GY 6333 Transport Phenomena

CBE-GY 6733 Chemical Engineering Thermodynamics

CBE-GY 6813 Chemical Reactor Analysis and Design

CBE-GY 8813 Biochemical Engineering

CBE-GY 9413 Selected Topics in Chemical and Biomolecular Engineering II

CBE-GY 9910 Colloquium in Chemical and Biomolecular Engineering

CBE-GY 9920 Colloquium in Chemical and Biomolecular Engineering

CBE-UY 401X Special Topics in Chemical and Biomolecular Engineering

CBE-UY 481X CBE Project

CBE-UY 491X Bachelor's Thesis in Chemical and Biomolecular Engineering

CBE-UY 495x Chemical and Biomolecular Engineering Internship

CBE-UY 1002 Introduction to Chemical and Biomolecular Engineering

CBE-UY 2124 Analysis of Chemical and Biomolecular Processes

CBE-UY 3153 Chemical and Biomolecular Engineering Thermodynamics

CBE-UY 3223 Kinetics and Reactor Design

CBE-UY 3233 Chemical and Biomolecular Engineering Separations

CBE-UY 3313 Transport I

CBE-UY 3323 Transport II

CBE-UY 3474 Introduction to Modern Optics

CBE-UY 4113 Engineering Laboratory I

CBE-UY 4143 Process Dynamics and Control

CBE-UY 4163 Chemical and Biomolecular Process Design I

CBE-UY 4173 Polymeric Materials

CBE-UY 4213 Engineering Laboratory II

CBE-UY 4263 Chemical and Biomolecular Process Design II

Chemistry

CM-GY 998X Research in Materials Chemistry

CM-GY 999X PhD Dissertation in Materials Chemistry

CM-GY 5021 Information Sources for the Chemical Sciences

CM-GY 5040 Chemical Laboratory Safety

CM-GY 6013 Advanced Inorganic Chemistry

CM-GY 6153 Special Topics in Inorganic Chemistry

CM-GY 7033 Quantum Chemistry

CM-GY 7043 Statistical Thermodynamics and Kinetics

CM-GY 7103 Biophysical Chemistry

CM-GY 7503 Special Topics in Physical Chemistry

CM-GY 7723 Synthesis of Macromolecules

CM-GY 7813 Characterization of Macromolecules

CM-GY 7853 Special Topics in Polymer Chemistry

CM-GY 8023 Principles of Spectroscopy

CM-GY 8073 Organic Spectroscopy

CM-GY 8103 Liquid Chromatography

CM-GY 8123 Mass Spectroscopy

CM-GY 8213 Bioanalytical Chemistry

CM-GY 8303 Nuclear Magnetic Resonance Spectroscopy

CM-GY 8323 Microscopy

CM-GY 8503 Special Topics in Analytical Chemistry

CM-GY 8713 Guided Studies in Chemistry I

CM-GY 8723 Guided Studies in Chemistry I

CM-GY 9033 Physical Organic Chemistry

CM-GY 9043 Synthetic Organic Chemistry

CM-GY 9053 Enzyme Catalysis in Organic Synthesis

CM-GY 9403 Special Topics in Organic Chemistry

CM-GY 9413 Biochemistry I

CM-GY 9423 Biochemistry II

CM-GY 9433 Protein Engineering

CM-GY 9443 Tissue Engineering

CM-GY 9453 Special Topics in Biochemistry

CM-GY 9463 Recombinant DNA Technology

CM-GY 9710 Chemical Colloquium

CM-GY 9731 Seminar in Chemistry I

CM-GY 9741 Seminar in Chemistry II

CM-GY 9751 Seminar in Chemistry III

CM-UY 471X Guided Studies in Chemistry

CM-UY 481X Special Topics in Chemistry

CM-UY 1004 General Chemistry for Engineers

CM-UY 1014 General Chemistry I

CM-UY 1024 General Chemistry II

CM-UY 1101 Numerical Methods for Chemistry

CM-UY 2102 Molecular Modeling in Chemistry

CM-UY 2211 Organic Chemistry Laboratory I

CM-UY 2213 Organic Chemistry I

CM-UY 2221 Organic Chemistry Laboratory II

CM-UY 2223 Organic Chemistry II

CM-UY 2614 Physical Chemistry I

CM-UY 3114 Inorganic Chemistry

CM-UY 3314 Biochemistry I

CM-UY 3323 Biochemistry II

CM-UY 3324 Biochemistry II

CM-UY 3334 Biochemistry for Engineers

CM-UY 3514 Analytical Chemistry

CM-UY 3614 Physical Chemistry II

CM-UY 4011 Information Sources for the Chemical Sciences

CM-UY 4314 Biomaterials

CM-UY 4413 Polymer Science

CM-UY 4914 Undergraduate Research in Chemistry

CM-UY 4924 Undergraduate Research in Chemistry

Civil Engineering

CE-GY 875X Employer Focused Residency

CE-GY 901X Readings in Civil Engineering

CE-GY 997X MS Thesis in Civil & Urban Engineering Department

CE-GY 997X Thesis for MS in Civil Engineering

CE-GY 998X Dissertation Level Research

CE-GY 999X PhD Dissertation in Civil & Urban Engineering

CE-GY 5983 Selected Topics in Civil Engineering I

CE-GY 5993 Selected Topics in Civil Engineering II

CE-GY 6013 Theory of Structural Analysis and Design

CE-GY 6023 Materials for Civil Engineers

CE-GY 6033 Selected Topics in Structural Analysis I

CE-GY 6043 Selected Topics in Structural Analysis II

CE-GY 6053 Monitoring Cities

CE-GY 6063 Bridge Engineering

CE-GY 6073 Instrumentation, Monitoring and Condition Assessment of Civil Infrastructure

CE-GY 6133 Stability of Structures

CE-GY 6143 Steel Structures

CE-GY 6163 Finite Element Methods

CE-GY 6183 Concrete Structures

CE-GY 6193 Wind and Earthquake Engineering

CE-GY 6253 Structural Dynamics

CE-GY 6263 Analysis and Design of Tall Buildings

CE-GY 7223 Hydrology

CE-GY 7233 Groundwater Hydrology and Pollution

CE-GY 7353 Selected Topics in Water Resources and Hydraulic Engineering I

CE-GY 7363 Selected Topics in Water Resources and Hydraulic Engineering II

CE-GY 7373 Environmental Chemistry and Microbiology

CE-GY 7393 Advanced Environmental Chemistry and Microbiology

CE-GY 7423 Water and Wastewater Treatment

CE-GY 7433 Advanced Water and Wastewater Treatment

CE-GY 7453 Water and Wastewater Treatment Laboratory

CE-GY 7463 Industrial Waste Treatment

CE-GY 7473 Modeling Fate and Transport of Surface Water Pollution

CE-GY 7513 Environmental Health Engineering

CE-GY 7523 Air Pollution

CE-GY 7533 Hazardous/Toxic Waste Management

CE-GY 7543 Site Remediation

CE-GY 7553 Environmental Toxicology

CE-GY 7563 Environmental Law

CE-GY 7573 Detection and Control of Waterborne Pathogens

CE-GY 7583 Air Pollution Engineering Control

CE-GY 7653 Wetland Design for Water Quality Improvement

CE-GY 7673 Environmental Impact Assessment

CE-GY 7703 Solid Waste Management

CE-GY 7713 Selected Topics in Environmental and Water Resources Eng

CE-GY 7723 Selected Topics in Environmental and Water Resources Eng I

CE-GY 7733 Geomatics and GIS Application in Civil and Environmental Engineering

CE-GY 7753 Environmental Systems Management

CE-GY 7813 Infrastructure Planning, Engineering and Economics

CE-GY 7823 Forensic Engineering

CE-GY 7833 Infrastructure Rehabilitation: A Practical Approach

CE-GY 7843 Urban Infrastructure Systems Management

CE-GY 7853 Infrastructure Asset Management

CE-GY 7863 Infrastructure Monitoring and Performance Assessment

CE-GY 7873 Infrastructure Systems Engineering

CE-GY 7883 Urban Informatics for Smart, Sustainable Cities

CE-GY 7963 Selected Topics in Construction I

CE-GY 7973 Selected Topics in Construction II

CE-GY 7983 Selected Topics in Infrastructure Systems

CE-GY 7993 Selected Topics in Infrastructure Systems

CE-GY 8203 Project Management

CE-GY 8243 Construction Modeling Techniques

CE-GY 8253 Project Management for Construction

CE-GY 8263 Construction Cost Estimating

CE-GY 8273 Contracts and Specifications

CE-GY 8283 Risk Analysis

CE-GY 8293 Construction Operations Analysis

CE-GY 8303 Information Systems in Project Management

CE-GY 8313 Engineering for Construction I: Methods and Technologies

CE-GY 8323 Engineering for Construction II: Design

CE-GY 8333 Marketing for Construction Management and Engineering Services

CE-GY 8343 Construction Site Safety

CE-GY 8353 Construction Scheduling

CE-GY 8363 Building Information Modeling Project Controls

CE-GY 8373 Construction Accounting and Finance

CE-GY 8383 Building Information Modeling (BIM) and Its Applications in AEC/FM

CE-GY 8393 Leadership, Ethics, and Project Execution

CE-GY 8403 Geotechnics and Geomaterials

CE-GY 8423 Ground Improvement

CE-GY 8433 Urban Geotechnology

CE-GY 8493 Environmental Geotechnology

CE-GY 8603 Selected Topics in Geotechnical Engineering

CE-GY 8663 Advanced Foundation Design

CE-GY 8673 Excavation Support Systems

CE-GY 8703 Managing and Leading in the 21st Century

CE-GY 8713 Construction and the Law

CE-GY 8723 How to Succeed in Construction

CE-GY 8733 Infrastructure Financing: Structuring of a Deal

CE-GY 8763 Capital Program Management/Program Development

CE-GY 8773 Dispute Avoidance and Resolution

CE-GY 8783 Construction Management and Planning

CE-GY 8803 Infrastructure Planning for Public Works

CE-GY 9105 Principles of Professional Practice I: Ethics

CE-GY 9205 Principles of Professional Practice II: Management

CE-GY 9305 Principles of Professional Practice III: Leadership

CE-GY 9903 Case Study in Urban Systems Engineering and Management

CE-GY 9910 Seminar in Civil Engineering

CE-GY 9950 PhD Candidates Research Seminar

CE-GY 9963 MS Project in Civil & Urban Engineering

CE-UY 496X Undergraduate Research Project in Civil & Urban Engineering

CE-UY 497X Undergraduate Thesis in Civil & Urban Engineering

CE-UY 1002 Introduction to Civil Engineering

CE-UY 2123 Mechanics of Materials

CE-UY 2133 Engineering Mechanics

CE-UY 2143 Analysis of Determinate Structures

CE-UY 2213 Fluid Mechanics and Hydraulics

CE-UY 2323 Traffic Engineering I

CE-UY 2343 Transportation Engineering

CE-UY 2513 Construction Materials and Methods

CE-UY 2523 Contracts and Construction Documents

CE-UY 2533 Construction Project Management

CE-UY 3013 Computing in Civil Engineering

CE-UY 3122 Structural Dynamics

CE-UY 3123 Dynamics of Extreme Events

CE-UY 3133 Structural Analysis

CE-UY 3143 Steel Design

CE-UY 3153 Geotechnical Engineering

CE-UY 3161 Materials Engineering Laboratory

CE-UY 3162 Materials Engineering

CE-UY 3163 Materials for the Built Environment

CE-UY 3173 Structural Design

CE-UY 3183 Structural Engineering

CE-UY 3223 Introduction to Environmental Engineering

CE-UY 3233 Environmental Engineering Process Design

CE-UY 3243 Water Resources Engineering

CE-UY 3253 Environmental Chemistry and Microbiology

CE-UY 3303 Traffic Engineering

CE-UY 3313 Introduction to Transportation Systems

CE-UY 3333 Transportation Systems and Software

CE-UY 3353 History of the New York City Transit System

CE-UY 3363 Transportation Economics

CE-UY 3373 Transportation Systems Analytics

CE-UY 3383 Urban Informatics for Social Good

CE-UY 3503 Cost Estimating

CE-UY 3513 Construction Scheduling

CE-UY 3533 Construction Site Layout and Surveying

CE-UY 3543 Building Information Modeling

CE-UY 3553 Non-Structural Building Systems

CE-UY 3563 Construction Modeling and Data Structures II

CE-UY 4033 Introduction to Urban Infrastructure Systems Management

CE-UY 4043 Sustainable Cities

CE-UY 4053 Biosoma - Environmental Design of the City of the Future

CE-UY 4092 Leadership, Business Principles, Policy and Ethics in Civil Engineering

CE-UY 4153 Structural Design Project

CE-UY 4173 Foundation Engineering

CE-UY 4183 Reinforced Concrete Design

CE-UY 4193 Timber and Masonry Structures

CE-UY 4213 Green Infrastructure Design

CE-UY 4253 Hydraulic Systems

CE-UY 4263 Environmental Geotechnology

CE-UY 4273 Environmental Engineering II

CE-UY 4393 Analytics and Learning Methods for Smart Cities

CE-UY 4443 Sensing the City: Methods for Urban Health Monitoring

CE-UY 4503 Construction Engineering

CE-UY 4513 Construction Project Administration

CE-UY 4523 Structural Building Systems

CE-UY 4533 Construction Law

CE-UY 4543 Construction Management Capstone

CE-UY 4613 Selected Topics in Structural and Geotechnical Engineering

CE-UY 4623 Selected Topics in Environmental and Water Resources Engineering

CE-UY 4633 Selected Topics in Transportation Engineering

CE-UY 4643 Selected Topics in Construction Management

CE-UY 4710 Readings in Civil Engineering

CE-UY 4802 Civil Engineering Capstone

CE-UY 4803 Civil Engineering Capstone

CE-UY 4813 Structural Engineering Capstone

CE-UY 4833 Transportation Engineering Capstone

CE-UY 4843 Urban and Infrastructure Informatics Capstone

CE-UY 4853 Construction Management Capstone

CE-UY 4863 Environmental Engineering Capstone

CE-UY 4911 Civil Engineering Internship I: Management

CE-UY 4921 Civil Engineering Internship II: Ethics

CE-UY 4931 Civil Engineering Internship III: Leadership

CE-UY 4990 Fundamentals of Engineering Exam Registration for CUE

Computer Science

Undergraduate Courses

Students are advised to consult the Schedule of Classes for changes in prerequisites effective after publication of this catalog. Students may not register for any junior- or senior-level courses until they complete all freshman requirements.

Graduate Courses

Graduate courses in computer science are regularly offered either every semester, annually or in two or three year cycles.

CS-GY 997X MS Thesis in Computer Science

CS-GY 999X PhD Dissertation in Computer Science

CS-GY 5303 Introduction to Programming and Problem Solving

CS-GY 5403 Data Structures and Algorithms

CS-GY 6003 Foundations of Computer Science

CS-GY 6005-6025 Variable Credit Project/ Course

CS-GY 6033 Design and Analysis of Algorithms I

CS-GY 6043 Design and Analysis of Algorithms II

CS-GY 6053 Foundation of Data Science

CS-GY 6063 Software Engineering

CS-GY 6073 Software Engineering II

CS-GY 6083 Principles of Database Systems

CS-GY 6093 Advanced Database Systems

CS-GY 6133 Computer Architecture I

CS-GY 6143 Computer Architecture II

CS-GY 6183 Fault-Tolerant Computers

CS-GY 6233 Introduction to Operating Systems

CS-GY 6243 Operating Systems II

CS-GY 6253 Distributed Operating Systems

CS-GY 6273 Performance Evaluation of Computer Systems

CS-GY 6313 Information Visualization

CS-GY 6323 Large-Scale Visual Analytics

CS-GY 6333 Massive Data Analysis

CS-GY 6373 Programming Languages

CS-GY 6413 Compiler Design and Construction

CS-GY 6513 Big Data

CS-GY 6533 Interactive Computer Graphics

CS-GY 6543 Human Computer Interaction

CS-GY 6553 Game Design

CS-GY 6573 Penetration Testing and Vulnerability Analysis

CS-GY 6613 Artificial Intelligence I

CS-GY 6643 Computer Vision

CS-GY 6673 Neural Network Computing

CS-GY 6703 Computational Geometry

CS-GY 6753 Theory of Computation

CS-GY 6803 Information Systems Security Engineering and Management

CS-GY 6813 Information, Security and Privacy

CS-GY 6823 Network Security

CS-GY 6843 Computer Networking

CS-GY 6873 Project in Telecommunication Networks

CS-GY 6903 Applied Cryptography

CS-GY 6913 Web Search Engines

CS-GY 6923 Machine Learning

CS-GY 6943 Artificial Intelligence for Games

CS-GY 6963 Digital Forensics

CS-GY 9013 Selected Topics in Computer Science

CS-GY 9023 Web Technologies and Integrated Environments

CS-GY 9033 Web Services and SOA

CS-GY 9093 Biometrics

CS-GY 9163 Application Security

CS-GY 9223 Selected Topics in Computer Science

CS-GY 9413 Readings in Computer Science I

CS-GY 9423 Readings in Computer Science II

CS-GY 9963 Advanced Project in Computer Science

CS-UY 394X Special Topics in Computer Science

CS-UY 410X Undergraduate Guided Studies in Computer Science

CS-UY 420X Undergraduate Research in Computer Science

CS-UY 1012 Introduction to Computer Engineering

CS-UY 1113 Problem Solving and Programming I

CS-UY 1114 Introduction to Programming and Problem Solving

CS-UY 1122 Introduction to Computer Science

CS-UY 1123 Problem Solving and Programming II

CS-UY 1133 Engineering Problem Solving and Programming

CS-UY 1134 Data Structures and Algorithms

CS-UY 1213 Introduction to Programming with Java

CS-UY 2053 Assembly Language

CS-UY 2124 Object Oriented Programming

CS-UY 2134 Data Structures and Algorithms

CS-UY 2163 Introduction to Programming in C

CS-UY 2164 Introduction to Programming in C

CS-UY 2204 Digital Logic and State Machine Design

CS-UY 2214 Computer Architecture and Organization

CS-UY 2413 Design and Analysis of Algorithms

CS-UY 3083 Introduction to Databases

CS-UY 3113 Game Programming

CS-UY 3224 Operating Systems

CS-UY 3233 Game Development Studio I

CS-UY 3254 Introduction to Parallel and Distributed Systems

CS-UY 3314 Design and Implementation of Programming Languages

CS-UY 3393 UNIX System Programming

CS-UY 3913 Java and Web Design

CS-UY 3923 Computer Security

CS-UY 3933 Network Security

CS-UY 4513 Software Engineering

CS-UY 4523 Design Project

CS-UY 4533 Interactive Computer Graphics

CS-UY 4533 Interactive Computer Graphics

CS-UY 4543 Human Computer Interaction

CS-UY 4553 Game Design

CS-UY 4563 Introduction to Machine Learning

CS-UY 4613 Artificial Intelligence

CS-UY 4753 Application Security

CS-UY 4763 Information Systems Security Engineering and Management

CS-UY 4773 Penetration Testing and Vulnerability Analysis

CS-UY 4783 Applied Cryptography

CS-UY 4793 Computer Networking

Culture, Arts and Media

CAM-UY 2014W STEM & Theater

CAM-UY 2204 Disability Studies

CAM-UY 2384 Jade, the Stone of Heaven

CAM-UY 3004 Special Topics in Culture, Arts and Media

CAM-UY 4504 Advanced Seminar in Culture, Arts and Media

Digital Media

DM-GY 997X MS Thesis in Integrated Digital Media

DM-GY 6033 Media Organizations

DM-GY 6043 Theories and Cultural Impact of Media & Technology

DM-GY 6053 Ideation & Prototyping

DM-GY 6063 Creative Coding

DM-GY 6103 Live Performance Studio

DM-GY 6113 Sound Studio

DM-GY 6123 Cinema Studio

DM-GY 6133 Mobile Augmented Reality Studio

DM-GY 6143 Interaction Design Studio

DM-GY 6153 Game Design Studio

DM-GY 6193 Web Studio

DM-GY 6213 Networked Media Studio Seminar

DM-GY 7033 Media Law

DM-GY 9101-3 Special Topics in Digital Media

DM-GY 9103 Special Topics in Digital Media

DM-GY 9963 MS Pre-Thesis in Digital Media: Research Methods

DM-GY 9990 Graduate Colloquium

DM-UY 1113 Audio Foundation Studio

DM-UY 1123 Visual Foundation Studio

DM-UY 1133 Creative Coding

DM-UY 1143 Ideation & Prototyping

DM-UY 2113 Sound Design for Media

DM-UY 2123 Narrative Cinema

DM-UY 2133 3D Modeling

DM-UY 2143 Interaction Design Studio

DM-UY 2153 Intro to Game Development

DM-UY 2173 Motion Graphics Studio

DM-UY 2183 Contemporary Techniques in Digital Photography and Imaging

DM-UY 2193 Intro to Web Development

DM-UY 2213 User Experience Design (UX)

DM-UY 2263 Still and Moving Images

DM-UY 3113 Contemporary Techniques in Sound Art

DM-UY 3123 Documentary Cinema

DM-UY 3133 3D Animation

DM-UY 3143 Interaction Design Studio 2

DM-UY 3153 Media in Game Design and Development

DM-UY 3173 Visualization and Simulation Studio

DM-UY 3183 Photography and Words

DM-UY 3193 Dynamic Web Applications

DM-UY 3213 Computer Music Studio

DM-UY 4001 Special Topics in IDM

DM-UY 4003 Senior Project in Digital Media

DM-UY 4034 Internship

DM-UY 4113 Sound Studio 3

DM-UY 4123 Experimental Cinema

DM-UY 4133 3D for Interactive Applications

DM-UY 4143 Interaction Design Studio 3

DM-UY 4153 Experimental Game Narratives

DM-UY 4173 Professional Practices for Creatives

DM-UY 4193 Mobile Application Development

DM-UY 4903-6 Undergraduate Thesis, Digital Media

DM-UY 4911-3 Special Topics in Digital Media

Economics

EC-UY 2524 Managerial Microeconomics

Electrical Engineering

Undergraduate Courses

Students should consult departmental adviser postings, handouts and the department's website for changes in required courses, course contents and prerequisites that go into effect after this catalog is published.

General prerequisites: students may not register for any junior- or senior-level courses until they complete all freshman and most sophomore requirements. For all EE courses, the Institute assumes knowledge of computer programming at the level of CS 1113 and of computational mathematics packages used in calculus courses.

Note: Elective courses whose identifiers have three numerical digits (e.g., EE-UY 107) are listed after the courses having identifiers with four numerical digits. Courses with identifiers of the form EL XYZ, available as senior electives, are listed with graduate EE
courses.

ECE-UY 116 Communication Electronics

ECE-UY 371 Guided Studies in Electrical Engineering

ECE-UY 372 Guided Studies in Electrical Engineering

ECE-UY 373 Guided Studies in Electrical Engineering

ECE-UY 374 Guided Studies in Electrical Engineering

ECE-UY 375 Guided Studies in Electrical Engineering

ECE-UY 376 Guided Studies in Electrical Engineering

ECE-UY 381 Guided Studies in Computer Engineering

ECE-UY 382 Guided Studies in Computer Engineering

ECE-UY 383 Guided Studies in Computer Engineering

ECE-UY 384 Guided Studies in Computer Engineering

ECE-UY 385 Guided Studies in Computer Engineering

ECE-UY 386 Guided Studies in Computer Engineering

ECE-UY 397 Senior Thesis

ECE-UY 442x Special Topics in Electrical Engineering

ECE-UY 1002 Introduction to Electrical and Computer Engineering

ECE-UY 1012 Introduction to Computer Engineering

ECE-UY 2004 Fundamentals of Electric Circuits

ECE-UY 2013 Fundamentals of Electric Circuits I

ECE-UY 2024 Fundamentals of Electric Circuits II

ECE-UY 2233 Introduction to Probability

ECE-UY 2613 Fundamentals of Electric Power Engineering for Non EE Students

ECE-UY 3054 Signals and Systems

ECE-UY 3064 Feedback Control

ECE-UY 3114 Fundamentals of Electronics I

ECE-UY 3124 Fundamentals of Electronics II

ECE-UY 3143 Introduction to Smart Grids

ECE-UY 3193 Introduction to Very Large Scale Integrated Circuits

ECE-UY 3363 Real-Time Embedded Controls and Instrumentation

ECE-UY 3404 Fundamentals of Communication Theory

ECE-UY 3414 Multimedia Communication Systems I

ECE-UY 3423 Light and Lightening

ECE-UY 3474 Introduction to Modern Optics

ECE-UY 3604 Electromagnetic Waves

ECE-UY 3613 Communication Networks

ECE-UY 3824 Electric Energy Conversion Systems

ECE-UY 4001 ECE Professional Development and Presentation

ECE-UY 4113 DPI- Controls and Robotics

ECE-UY 4123 EE DPI- Electrical Power and Machinery

ECE-UY 4144 Introduction to Embedded Systems Design

ECE-UY 4153 EE DPI- Multimedia

ECE-UY 4163 REAL-TIME DIGITAL SIGNAL PROCESSING (DP1)

ECE-UY 4173 EE DPI- Telecommunication Networks

ECE-UY 4183 EE DP I-Wireless Communication

ECE-UY 4223 Electrical Engineering Design Project II

ECE-UY 4283 Wireless Information Systems Laboratory II

ECE-UY 4313 Computer Engineering Design Project I

ECE-UY 4323 Computer Engineering Design Project II

ECE-UY 4414 Multimedia Communication Systems II

ECE-UY 4513 Nanoelectronic devices and circuits

ECE-UY 4563 Introduction to Machine Learning

ECE-UY 4823 Electric and Hybrid Vehicles

ECE-UY 4863 Power Electronics for the Internet of Things

ECE/CS 1012 Introduction to Computer Engineering

Electrical Engineering (Graduate)

ECE-GY 90X3 Selected Topics in Wireless Communication (X=1, 2, 9)

ECE-GY 91X3 Selected Topics in Signal Processing (X=1, 2,...9)

ECE-GY 92X3 Selected Topics in Control Systems (X=1, 2,...9)

ECE-GY 93X3 Selected Topics in Telecommunications and Networking (X=1, 2,...9)

ECE-GY 94X3 Selected Topics in Computer Electronic Devices and Systems (X=1, 2,...9)

ECE-GY 95X3 Selected Topics in Electro- Optics, Quantum Electronics and Material Science (X=1, 2,...9)

ECE-GY 96X3 Selected Topics in Power Engineering (X=1, 2,...9)

ECE-GY 97X3 Selected Topics in Electrodynamics, Wave Phenomena and Plasmas (X=1, 2,...9)

ECE-GY 997x MS Thesis in Electrical & Computer Engineering Department

ECE-GY 999X PhD Dissertation in Electrical Engineering

ECE-GY 5023 Wireless Information Systems Laboratory I

ECE-GY 5033 Wireless Information Systems Laboratory II

ECE-GY 5213 Introduction to Systems Engineering

ECE-GY 5223 Sensor Based Robotics

ECE-GY 5253 Applied Matrix Theory

ECE-GY 5373 Internet Architecture and Protocols

ECE-GY 5463 Introduction to RF/Microwave Integrated Circuits

ECE-GY 5533 Physics of Nanoelectronics

ECE-GY 5553 Physics of Quantum Computing

ECE-GY 5613 Introduction to Electric Power Systems

ECE-GY 5623 Finite Elements for Electrical Engineering

ECE-GY 5663 Physics of Alternative Energy

ECE-GY 5733 RF and Microwave Systems Engineering

ECE-GY 5753 Introduction to Plasma Engineering

ECE-GY 5813 Biomedical Instrumentation

ECE-GY 5823 Biomedical Imaging I

ECE-GY 6013 Digital Communications

ECE-GY 6023 Wireless Communications

ECE-GY 6063 Information Theory

ECE-GY 6113 Digital Signal Processing I

ECE-GY 6123 Image and Video Processing

ECE-GY 6143 Machine Learning

ECE-GY 6183 Digital Signal Processing Laboratory

ECE-GY 6213 System Modeling, Analysis and Design

ECE-GY 6233 System Optimization Method

ECE-GY 6243 System Theory and Feedback Control

ECE-GY 6253 Linear Systems

ECE-GY 6263 Game Theory

ECE-GY 6303 Probability and Stochastic Processes

ECE-GY 6333 Detection and Estimation Theory

ECE-GY 6363 Data Center and Cloud Computing

ECE-GY 6383 High-Speed Networks

ECE-GY 6403 Fundamentals of Analog Integrated Circuit Design

ECE-GY 6443 VLSI System and Architecture Design

ECE-GY 6453 Advances in Reconfigurable Systems

ECE-GY 6463 Advanced Hardware Design

ECE-GY 6473 Introduction to VLSI System Design

ECE-GY 6483 Real Time Embedded Systems

ECE-GY 6493 Design and Test of Digital Systems

ECE-GY 6513 Fundamentals of Solid-State Electronic Devices

ECE-GY 6523 Nanoelectronic Devices

ECE-GY 6553 Quantum Mechanics I

ECE-GY 6583 Fiber Optic Communications

ECE-GY 6603 Power Electronics

ECE-GY 6613 Electrical Transmission & Distribution Systems

ECE-GY 6623 Smart Grids: Control, Economics, Planning and Regulation

ECE-GY 6633 Transients, Surges and Faults in Power Systems

ECE-GY 6653 Power System Operation and Control

ECE-GY 6663 Distributed Generation Systems

ECE-GY 6673 Resonant Power Converters

ECE-GY 6683 Electric Drives

ECE-GY 6693 Electronic Power Supplies

ECE-GY 6713 Electromagnetic Theory and Applications

ECE-GY 6723 Electromagnetic Radiation and Antennas

ECE-GY 6813 Medical Imaging

ECE-GY 6913 Computing Systems Architecture

ECE-GY 7133 Digital Signal Processing II

ECE-GY 7143 Advanced Machine Learning

ECE-GY 7213 Robot Localization and Navigation

ECE-GY 7233 Optimal and Stochastic Control and Applications

ECE-GY 7253 State Space Design for Linear Control Systems

ECE-GY 7353 Network Modeling and Analysis

ECE-GY 7363 Network Design and Algorithms

ECE-GY 7373 High Performance Switches and Routers

ECE-GY 8223 Applied Nonlinear Control

ECE-GY 8253 Large-Scale Systems and Decentralized Control

ECE-GY 9473 Sel Tpcs in Computer Electronic Devices & Systems

ECE-GY 9900 Seminar in Electrical and Computer Engineering

ECE-GY 9933 Readings in Electrical and Computer Engineering I

ECE-GY 9941 Advanced Projects III

ECE-GY 9943 Readings in Electrical and Computer Engineering II

ECE-GY 9953 Advanced Projects I

ECE-GY 9963 Advanced Projects II

ECE-GY 9980 Electrical Engineering Area Exam

English

EN-UY 2114W Poetry as Structure and Design

EN-UY 2124W The Short Story

EN-UY 2134W The Novella: Between the Short Story and the Novel

EN-UY 2174W The World's Greatest Journeys

EN-UY 2194W The Rise of the Graphic Novel

EN-UY 2204W Science Journalism

EN-UY 2244 Shakespeare and the Creative Imagination

EN-UY 2254W Literature and War

EN-UY 2324W Technologies of Literary Production

EN-UY 2334W Literary Inventiveness

EN-UY 2354W Inventing America: Nation, Culture, Self

EN-UY 2414W The City and Literature

EN-UY 2424 Medicine and Literature

EN-UY 2424W Medicine and Literature

EN-UY 3000W English Special Topics

EN-UY 3104 Science Fiction Workshop

EN-UY 3144W Analytical Approaches to Poetry and Art

EN-UY 3154 Fantasy Workshop

EN-UY 3164W Special Topics in English Literature

EN-UY 3194W Ethical Questions in Literature

EN-UY 3434W Machines Made of Words II: Designing Poetry

EN-UY 3814W The Environment and Literature

EXPOS-UA 1 Writing the Essay

EXPOS-UA 2 The Advanced College Essay

EXPOS-UA 3 International Writing Workshop: Introduction

EXPOS-UA 4 International Workshop Writing I

EXPOS-UA 9 International Workshop Writing II

EXPOS-UA 13 Writing Tutorial

Finance

Undergraduates in Graduate FRE Courses

The Department of Finance and Risk Engineering does not permit undergraduates to take courses with the prefix "FRE"; these are graduate courses reserved for graduate students. Exceptions are made only for sub-matriculated undergraduates; undergraduates who have applied to and been accepted to the MS FE program at NYU Tandon in their Senior year of undergraduate studies. No other exceptions are made.

FIN-UY 2003 Economic Foundations of Finance

FIN-UY 2103 Creating and Understanding Financial Statements

FIN-UY 2203 Corporate Finance and Financial Markets

FIN-UY 3213 Financial Management and Risk Engineering

FIN-UY 3233 Derivatives and the Options Market

FIN-UY 3403 Entrepreneurship and Financial Management

FIN-UY 3503 Financial Risk Modeling and Analytics

FIN-UY 4903 Special Topics in Finance and Risk Engineering

RSK-UY 3593 Probabilistic Risk Assessment

Finance and Risk Engineering

Undergraduates in Graduate FRE Courses

The Department of Finance and Risk Engineering does not permit undergraduates to take courses with the prefix "FRE"; these are graduate courses reserved for graduate students. Exceptions are made only for sub-matriculated undergraduates; undergraduates who have applied to and been accepted to the MS FE program at NYU Tandon in their Senior year of undergraduate studies. No other exceptions are made.

FRE-GY 5010 FRE Bootcamp I

FRE-GY 5020 FRE Bootcamp II

FRE-GY 5030 FRE Bootcamp III - From Brain Teasers to Black-Scholes

FRE-GY 5040 FRE Bootcamp IV - Risk, Applied Statistics, and Probability

FRE-GY 5500 Bloomberg Certification

FRE-GY 5990 Capstone Assessment

FRE-GY 6003 Financial Accounting

FRE-GY 6021 Financial Insurance and Credit Derivatives

FRE-GY 6023 Financial Economics

FRE-GY 6031 Money, Banking and Financial Markets

FRE-GY 6041 Extreme Risk Analytics

FRE-GY 6051 Insurance Finance and Actuarial Science

FRE-GY 6071 Derivatives, Financial Markets and Technology

FRE-GY 6073 Introduction to Derivative Securities

FRE-GY 6083 Quantitative Methods in Finance

FRE-GY 6091 Financial Econometrics

FRE-GY 6103 Valuation for Financial Engineering

FRE-GY 6111 Investment Banking and Brokerage

FRE-GY 6123 Financial Risk Management

FRE-GY 6131 Clearing and Settlement and Operational Risk

FRE-GY 6141 Static and Dynamic Hedging

FRE-GY 6143 Life Insurance and Related Financial Products

FRE-GY 6153 Foundations of Financial Technology

FRE-GY 6163 Life Contingencies II

FRE-GY 6171 Management of Financial Institutions

FRE-GY 6191 Advanced Topics in Financial Technology

FRE-GY 6211 Financial Market Regulation

FRE-GY 6223 Actuarial Models

FRE-GY 6231 Stochastic Calculus in Finance

FRE-GY 6233 Options Pricing & Stochastic Calculus

FRE-GY 6243 Credibility and Loss

FRE-GY 6251 Numerical and Simulation Techniques in Finance

FRE-GY 6273 Advanced Valuation Theory

FRE-GY 6291 Applied Derivative Contracts

FRE-GY 6303 Dynamic Assets and Option Pricing

FRE-GY 6311 Dynamic Assets and Option Pricing

FRE-GY 6311 Dynamic Assets and Options Pricing

FRE-GY 6321 Casualty I

FRE-GY 6331 Financial Risk Management & Optimization

FRE-GY 6341 Casualty II

FRE-GY 6351 Econometrics and Time Series Analysis

FRE-GY 6361 Corporate and Financial Strategy

FRE-GY 6371 Contract Economics

FRE-GY 6391 Mergers & Acquisitions

FRE-GY 6411 Fixed Income Securities and Interest Rate Derivatives

FRE-GY 6431 Electronic Market Design

FRE-GY 6451 Behavioral Finance

FRE-GY 6471 Applied Financial Econometrics

FRE-GY 6491 Credit Risk & Financial Risk Management

FRE-GY 6511 Derivatives Algorithms

FRE-GY 6551 Accounting for Financial Products

FRE-GY 6571 Asset-Backed Securities and Securitization

FRE-GY 6591 Real Estate Finance and Mortgage-Backed Securities

FRE-GY 6611 Credit Derivatives

FRE-GY 6631 Applied Derivatives and Real Options Finance

FRE-GY 6651 Term Structure Modeling and Advanced Interest Rate Derivatives

FRE-GY 6671 Global Finance

FRE-GY 6691 Intermediate Credit Derivatives Valuation and Applications

FRE-GY 6711 Quantitative Portfolio Management

FRE-GY 6713 Advanced Investment Theory and Applications

FRE-GY 6731 Market Risk Management and Regulation

FRE-GY 6751 Credit Risk Measurement and Management

FRE-GY 6771 Financial Optimization Techniques

FRE-GY 6791 Operational Risk Measurement and Management

FRE-GY 6803 Financial Engineering (Research Course)

FRE-GY 6811 Financial Software Laboratory

FRE-GY 6821 Financial Econometric Laboratory

FRE-GY 6831 Computational Finance Laboratory

FRE-GY 6861 Financial Software Engineering Laboratory

FRE-GY 6871 R in Finance

FRE-GY 6883 Financial Computing

FRE-GY 6901 Selected Topics in Financial Engineering: QUANTITATIVE FINANCE & BIG DATA ANALYTICS (TOPFER CHAIR LECTURE SERIES)

FRE-GY 6911 Financial Regulation

FRE-GY 6921 Selected Topics in Financial Engineering, FINANCIAL MARKETS: COMMODITY FINANCIAL MARKET

FRE-GY 6921-6991 Selected Topics in Financial Engineering

FRE-GY 6931 Selected Topics in Financial Engineering: FINANCIAL COMPLIANCE & BANK REGULATIONS

FRE-GY 6971 Selected Topics in Financial Engineering: FINANCIAL ANALYTICS

FRE-GY 6991 Selected Topics in Financial Engineering: FIN ADVISING & INVEST MGMNT

FRE-GY 7003 Financial Accounting and Analysis

FRE-GY 7021 Financial Engineering Capstone: Internship

FRE-GY 7023 Financial Engineering Capstone: Internship

FRE-GY 7043 Financial Engineering Capstone: Project

FRE-GY 7103 Macroeconomics

FRE-GY 7121 Statistical Arbitrage

FRE-GY 7211 Forensic Financial Technology and Regulatory Systems

FRE-GY 7221 Big Data in Finance

FRE-GY 7241 Algorithmic Portfolio Management

FRE-GY 7251 Algorithmic Trading & High-Frequency Finance

FRE-GY 7261 News Analytics and Strategies

FRE-GY 7703 Data Science for Financial Engineering

FRE-GY 7773 Machine Learning in Financial Engineering

FRE-GY 7801 Topics in Finance and Financial Markets I

FRE-GY 7811 Quant Topics in Financial Markets II: Financial Risk Management

FRE-GY 7821 Topics in Risk Finance I

FRE-GY 7831 Topics in Financial and Risk Engineering I: FINANCIAL ANALYTICS & BIG DATA

FRE-GY 7841 Topics in Risk Finance II

FRE-GY 7851 Topics in Financial and Risk Engineering II

FRE-GY 7871 Topics in Financial Information Services and Technology

FRE-GY 7891 Topics in Management of Financial Services: FINANCIAL COMPLIANCE & BANKING REGULATION

FRE-GY 9713 Special Topics in Asset Pricing

FRE-GY 9733 Special Topics in Financial Engineering

FRE-GY 9743 Special Topics in Risk Management

FRE-GY 9973 MS Thesis in Finance & Risk Engineering

General Engineering

EG-UY 1001 Engineering and Technology Forum

EG-UY 1003 Introduction to Engineering and Design

EG-UY 3003 Precapstone Innovation

EX-UY 1 Examination Hour

EX-UY 2 Examination Hour

VIP-UY 300X Vertically Integrated Projects

VIP-UY 3000 Vertically Integrated Projects

General Studies

GS-UY 101 Computer Skills for Engineers

GS-UY 102 Pre-college Writing

GS-UY 103 Pre-college Math

GS-UY 106 Pre-college Physics

Higher Education Oppurtunity Program

HE-UY 1 Study Skills

History

HI-UY 2514W Introduction to New York City History

HI-UY 2534 History of Computing

HI-UY 2724 Urban Environmental History

HI-UY 3034 Introduction to Urban Infrastructure History

HI-UY 3034W History of New York's Urban Infrastructure

HI-UY 3144 History of American Capitalism: Enterprise, Technology and Work

HI-UY 3254W History of Mass Media

HI-UY 3304 Science and Technology as a Strategic Resource in World War II

HI-UY 3434 History of Intellectual Property in America

HI-UY 4334W Seminar in Urban Infrastructure History

Industrial Engineering

IE-GY 6003 Engineering Economics

IE-GY 6063 Work Design and Measurement

IE-GY 6113 Quality Control and Improvement

IE-GY 6123 Quality Engineering Using Robust Design

IE-GY 6163 Job and Workplace Design

IE-GY 6183 Inventory Models

IE-GY 6193 Production Planning and Control

IE-GY 6203 Project Planning and Control (Project Management)

IE-GY 6213 Facility Planning and Design

IE-GY 6273 Operations Research: Deterministic Models

IE-GY 6273 Operations Research: Deterministic Models

IE-GY 6283 Operations Research: Stochastic Models

IE-GY 6283 Operations Research: Stochastic Models

IE-GY 6453 Productivity Management

IE-GY 6503 Queuing Systems I

IE-GY 6823 Factory Simulation

IE-GY 6853 System Reliability

IE-GY 7113 Engineering Applications in the Business Environment

IE-GY 7213 Engineering Applications in the Business Environment

IE-GY 7653 Human Factors in Engineering Design

IE-GY 7753 Industrial Safety Engineering

IE-GY 7763 Manufacturing Resources Planning

IE-GY 7853 computer Integrated Manufacturing Systems

IE-GY 7873 Lean Manufacturing

IE-GY 7883 Manufacturing Systems Engineering

IE-GY 7923 Design for Manufacturability

IE-GY 7933 Environmental Health and Safety

IE-GY 7993 Supply Chain Engineering

IE-GY 9113 Selected Topics in IE

IE-GY 9123 Selected Topics in IE

IE-GY 9303 Readings in Industrial Engineering I

IE-GY 9313 Readings in Industrial Engineering II

Journalism

JW-GY 6003 Introduction to Technical Communication

JW-GY 6313 Proposal Writing

Technology Management and Innovation

Graduate Courses

The MOT program's series of required courses provide participants with a deep understanding of the foundations of managerial competencies needed to manage innovation in the evolving business environment. In addition, participants can choose an elective from the Department of Technology Management or from other areas of the Institute that can enhance their understanding of a particular area of interest in the broadly defined arena of technology management.

MG-GY 997X MS Thesis in Technology Management

MG-GY 999X PhD Dissertation in Technology Management

MG-GY 5050 Probability and Managerial Statistics

MG-GY 6013 Organizational Behavior

MG-GY 6023 Economics & Strategy

MG-GY 6033 Financial Analysis for Tech Managers

MG-GY 6043 Innovation Management in Money, Banking and Financial Markets

MG-GY 6073 Marketing

MG-GY 6083 Economics

MG-GY 6093 Accounting & Finance

MG-GY 6103 Management Science

MG-GY 6113 Career Management

MG-GY 6123 Human Resource Management

MG-GY 6131 Labor Relations

MG-GY 6141 Conflict Management

MG-GY 6153 Leadership Development and Team Building

MG-GY 6163 Job and Workplace Design

MG-GY 6173 Performance Management and Reward Systems

MG-GY 6181 Talent Management Systems

MG-GY 6183 Communication for Technology Managers

MG-GY 6191 Coaching in Organizations

MG-GY 6193 Statistics for Data Analysts

MG-GY 6201 Consulting in Organizations

MG-GY 6203 Data Visualization for Business Intelligence

MG-GY 6211 Outsourcing: A Human Capital Strategy

MG-GY 6223 Staffing Systems in Organizations

MG-GY 6233 Training Systems in Organizations

MG-GY 6243 Change Management Systems in Organizations

MG-GY 6253 Seminar in Organization and Career Change

MG-GY 6263 Human Resource Information Systems

MG-GY 6271 Managing Human Resource Technology in Organizations

MG-GY 6283 Web-Based Human Resource Management

MG-GY 6293 Managing Technical Professionals

MG-GY 6303 Operations Management

MG-GY 6313 Organization Theory and Design

MG-GY 6321 Global Human Resource Management

MG-GY 6333 Research Methods in Organizational Behavior & Human Capital Systems

MG-GY 6343 Human Capital Engineering & Analytics

MG-GY 6353 Quality Management

MG-GY 6361 Managing Business Process Reengineering

MG-GY 6373 Human Capital Big Data, Predictive Analytics, & ROI

MG-GY 6383 Seminar in Managing HR Analytics & Big Data

MG-GY 6391 Managing Knowledge-Based Enterprises

MG-GY 6401 Employee Engagement: Theory and Practice

MG-GY 6463 Supply Chain Management

MG-GY 6503 Management of Information Technology and Information Systems

MG-GY 6523 Telecommunications Policy

MG-GY 6543 Economics for Information Sectors

MG-GY 6553 Telecommunications Management I

MG-GY 6563 Telecommunications Management II

MG-GY 6603 Management of New and Emerging Technologies

MG-GY 6643 Management and the Legal System

MG-GY 6703 Operations Management for knowledge-Based Enterprises

MG-GY 6903 Managerial Decision Making for Information-Intensive Businesses

MG-GY 6933 Information Technologies, Systems and Management in Organizations

MG-GY 7173 Enterprise Data Systems

MG-GY 7183 Strategy for the Modern Enterprise

MG-GY 7203 Intercultural Dimensions of Global Management

MG-GY 7503 Digital Business Management

MG-GY 7671 Global Retailing and Supply Chain Management

MG-GY 7693 Managerial Analytics

MG-GY 7703 Entrepreneurship

MG-GY 7733 Services Innovation

MG-GY 7743 Advanced Trends in Technology Management and Innovation

MG-GY 7811 Selected Topics in Networking and Information Technologies

MG-GY 7841 Negotiation in Technology Intensive Sectors

MG-GY 7851 Leadership

MG-GY 7861 High-technology Entrepreneurship

MG-GY 7871 Intellectual Property for Technology and Information Managers

MG-GY 7873 Managing Intellectual Property and Intellectual Capital

MG-GY 7881 Modern Supply Chain Management: Integration Through Technology

MG-GY 7883 Information Security and Privacy: Systems

MG-GY 7891 Special Elective Topics for EMOT and EIM

MG-GY 7953 Global Innovation

MG-GY 7963 Modern Financial Institutions and Their Competitive Environment

MG-GY 7971 Financing for Value Creation

MG-GY 7983 Managing Technological Innovation and Emerging Technologies in Financial Services

MG-GY 8203 Project Management

MG-GY 8213 Information Security and Privacy for Managers

MG-GY 8223 Agile Project Management

MG-GY 8233 Quality Management/Six-Sigma

MG-GY 8253 Project Management for Construction

MG-GY 8263 Construction Cost Estimating

MG-GY 8273 Contracts and Specifications

MG-GY 8303 Human Resource Management Systems

MG-GY 8333 Information Security and Privacy: Operations

MG-GY 8363 Fundamentals of Information Security Management

MG-GY 8401 Programming for Business Intelligence and Analytics

MG-GY 8411 Data Engineering

MG-GY 8413 Business Analytics

MG-GY 8423 Machine Learning for Business

MG-GY 8573 Managing Cleantech and Renewable Energy Innovation

MG-GY 8603 Financial Planning and Control

MG-GY 8613 Product Design Studio

MG-GY 8623 Design Strategies

MG-GY 8633 Market Research

MG-GY 8643 New Product Development

MG-GY 8653 Managing Technological Change and Innovation

MG-GY 8663 Technology Policy

MG-GY 8673 Technology Strategy

MG-GY 8683 Economics & Strategies for Digital Platforms

MG-GY 8691 AI-based Business Model Innovation

MG-GY 8693 Special Topics

MG-GY 8703 Introduction to Modern Information Technology Strategy

MG-GY 8711 Introduction to Entrepreneurial Finance

MG-GY 8713 Entrepreneurial Finance

MG-GY 8721 Introduction to Managing Growing Enterprises

MG-GY 8723 Managing Growing Enterprises

MG-GY 8731 Introduction to Corporate Entrepreneurship

MG-GY 8733 Corporate Entrepreneurship

MG-GY 8741 Introduction to Entrepreneurial Marketing and Sales

MG-GY 8743 Entrepreneurial Marketing and Sales

MG-GY 8753 Information Technology: Systems

MG-GY 8763 Information Technology: Operations

MG-GY 8763 Knowledge Management

MG-GY 8783 Managing Cloud Computing

MG-GY 9013 Design Thinking for Creative Problem Solving

MG-GY 9203 Seminar in Managing Knowledge-Workers in Innovative Organizations

MG-GY 9213 Seminar in Information Systems Management

MG-GY 9223 Seminar in Business Process Innovation

MG-GY 9233 Seminar in Managing Technological Change and Innovation

MG-GY 9243 Technology Management and Policy

MG-GY 9253 Technology Strategy, Structure and Decision Making

MG-GY 9263 Strategic Marketing Seminar

MG-GY 9273 Doctoral Seminar in Technology Adoption and Diffusion

MG-GY 9283 Doctoral Seminar on Entrepreneurship

MG-GY 9293 Seminar on Content Innovation

MG-GY 9303 Advanced Topics—Organizational Behavior and Organizational Theory

MG-GY 9313 Introduction to Behavioral Sciences

MG-GY 9321 Special Topics

MG-GY 9323 Special Topics

MG-GY 9343 Research Project in Organizational Behavior

MG-GY 9403 Business Research Methods

MG-GY 9413 Quantitative Methods Seminar I

MG-GY 9423 Quantitative Methods Seminar II

MG-GY 9433 Qualitative Research Methods

MG-GY 9501 eMOT Capstone-1

MG-GY 9503 MOT Capstone Project Course

MG-GY 9511 eMOT Capstone-2

MG-GY 9601 eIM Capstone-1

MG-GY 9603 eIM Capstone Project Course

MG-GY 9611 eIM Capstone-2

MG-GY 9651 The Modern CIO: Challenges and Opportunities

MG-GY 9683 Internship and Action Learning

MG-GY 9691 The Modern Chief Information Security Officer: Challenges and Opportunities

MG-GY 9703 Project in Strategy and Innovation

MG-GY 9763 Readings in Management

MG-GY 9771 Readings in Management

MG-GY 9853 Selected Topics in Organizational Behavior

MG-GY 9861 Readings in Organizational Behavior

MG-GY 9873 Readings in Organizational Behavior

MG-GY 9913 Independent Research

MG-UY 444X Guided Studies in BTM

MG-UY 1002 Foundations of Management

MG-UY 2004 Management of Information Technology and Systems

MG-UY 2014 Operations Management

MG-UY 2104 Organizational Behavior

MG-UY 2204 Financial Accounting

MG-UY 2304 Marketing

MG-UY 2524 Microeconomics

MG-UY 2704 Design Thinking for Creative Problem Solving

MG-UY 3002 Project Management

MG-UY 3024 Management of Data Communications and Networking

MG-UY 3204 Introduction to Finance

MG-UY 3214 Advanced Corporate Finance

MG-UY 3304 Introduction to Supply Chain Management

MG-UY 3404 Innovation Management

MG-UY 3714 Design Strategies

MG-UY 3724 Human-centered Product Design

MG-UY 3734 Service Design Innovation

MG-UY 4004 Management Strategy in Technology Sectors

MG-UY 4014 Introduction to E-Business

MG-UY 4111 Special Topics in Management (1 Cr)

MG-UY 4112 Special Topics in Management (2 Cr)

MG-UY 4113 Special Topics in Management (3 Cr)

MG-UY 4114 Special Topics in Management (4 Cr)

MG-UY 4204 Management Science

MG-UY 4214 Financial Strategy

MG-UY 4404 Entrepreneurship

MG-UY 4504 Global Perspectives on Technology Management: A Capstone Project Course

MG-UY 4514 Honors Capstone Project in Technology, Innovation and/or Information Management and Entrepreneurship I

MG-UY 4524 Honors Capstone Project in Technology, Innovation and/or Information Management Or Entrepreneurship II

MG-UY 4603 Technology Management-Internship and Service

MG-UY 4904 BS Thesis in Business and Technology Management

PL-UY 4052 Business Ethics

Manufacturing Engineering

Graduate Courses

The courses with MN designations below are followed by courses from other programs that commonly are taken by manufacturing engineering students.

MN-GY 6113 Quality Control and Improvement

MN-GY 6123 Quality Engineering Using Robust Design

MN-GY 6303 Operations Management

MN-GY 6323 Building High Performance Teams

MN-GY 6513 Design Strategies

MN-GY 7503 Introduction to Target Costing—Customer Driven Product Design

MN-GY 7713 Product Realization Process

MN-GY 7763 Manufacturing Resources Planning

MN-GY 7853 Computer Integrated Manufacturing Systems (CIMS)

MN-GY 7873 Lean Manufacturing

MN-GY 7883 Manufacturing Systems Engineering

MN-GY 7893 Production Science

MN-GY 7923 Design for Manufacturability

MN-GY 7933 Environmental Health and Safety

MN-GY 7943 Physical Design of Products

MN-GY 7953 Basics of Supply Chain Operations Management

MN-GY 7963 Electronics Systems Manufacturing

MN-GY 7983 Supply Chain Infrastructure

MN-GY 7993 Supply Chain Engineering

MN-GY 8023 Thermal Design of Electronics System for Performance and Reliability

MN-GY 8043 Thermal Issues in Manufacturing Processes

MN-GY 8643 New Product Development

MN-GY 8653 Managing Technological Change and Innovation

MN-GY 9113 Selected Topics in Manufacturing Engineering I

MN-GY 9123 Selected Topics in Manufacturing Engineering II

MN-GY 9303 Readings in Manufacturing Engineering I

MN-GY 9313 Readings in Manufacturing Engineering II

MN-GY 9963 MS Report I

MN-GY 9973 MS Report II

Materials Science

ME-UY 2811 Materials Science Laboratory

ME-UY 2813 Introduction to Materials Science

MT-UY 4853 Manufacturing Engineering and Processes

Mathematics

MA-GY 942X Reading in Mathematics II

MA-GY 997X MS Thesis in Math

MA-GY 6213 Elements of Real Analysis I

MA-GY 6223 Elements of Real Analysis II

MA-GY 6963 Statistics

MA-GY 7033 Linear Algebra I

MA-GY 7043 Linear Algebra II

MA-GY 9413 Reading in Mathematics I

MA-GY 9433 Reading in Mathematics III

MA-GY 9443 Reading in Mathematics IV

MA-GY 9453 Reading in Mathematics V

MA-UY 492X Independent Study

MA-UY 914 Precalculus for Engineers

MA-UY 1024 Calculus I for Engineers

MA-UY 1124 Calculus II for Engineers

MA-UY 1324 Integrated Calculus I for Engineers

MA-UY 1424 Integrated Calculus II for Engineers

MA-UY 2034 Linear Algebra and Differential Equations

MA-UY 2054 Applied Business Data Analysis I

MA-UY 2114 Calculus III: Multi-Dimensional Calculus

MA-UY 2224 Data Analysis

MA-UY 2233 Introduction to Probability

MA-UY 2314 Discrete Mathematics

MA-UY 2414 Basic Practice of Statistics

MA-UY 2514 Honors Calculus III

MA-UY 3014 Applied Probability

MA-UY 3034 Applied Linear Algebra

MA-UY 3044 Linear Algebra

MA-UY 3054 Honors Linear Algebra

MA-UY 3113 Advanced Linear Algebra and Complex Variables

MA-UY 3204 Linear and Nonlinear Optimization

MA-UY 3514 Honors Probability

MA-UY 4014 Theory of Numbers

MA-UY 4044 Algebra

MA-UY 4054 Honors Algebra I

MA-UY 4064 Honors Algebra II

MA-UY 4114 Applied Statistics

MA-UY 4204 Ordinary Differential Equations

MA-UY 4214 Applied Ordinary Differential Equations

MA-UY 4314 Combinatorics

MA-UY 4324 Mathematics of Finance

MA-UY 4414 Applied Partial Differential Equations

MA-UY 4424 Numerical Analysis

MA-UY 4434 Applied Complex Variables

MA-UY 4444 Intro to Math Modeling

MA-UY 4474 Chaos and Dynamical Systems

MA-UY 4614 Applied Analysis

MA-UY 4644 Honors Analysis I

MA-UY 4654 Honors Analysis II

MA-UY 4674 Differential Geometry

MA-UY 4684 Topology

MA-UY 4814 Honors I

MA-UY 4824 Honors II

MA-UY 4834 Honors II

MA-UY 4844 Honors IV

MA-UY 4993 B.S. Thesis in Mathematics

Mechanical Engineering

ME-GY 996X MS Project in Mechanical Engineering

ME-GY 997X MS Thesis in Mechanical Engineering

ME-GY 999X PhD Dissertation in Mechanical Engineering

ME-GY 5103 Biomedical Fluid Dynamics

ME-GY 5243 Composite Materials

ME-GY 5253 Physics of Nanomaterials and Graphene

ME-GY 5443 Vibrations

ME-GY 5653 Microelectromechanical Systems

ME-GY 5813 Research & Design Methodology & Communication

ME-GY 6003 Applied Mathematics in Mechanical Engineering

ME-GY 6013 Thermodynamics

ME-GY 6043 Thermal Engineering Fundamentals

ME-GY 6153 Thermodynamics of HVAC Systems

ME-GY 6163 Fluid Mechanics for HVAC Systems

ME-GY 6173 Heat Transfer for HVAC Systems

ME-GY 6183 Design of HVAC Systems

ME-GY 6213 Introduction to Solid Mechanics

ME-GY 6223 Advanced Mechanics of Materials

ME-GY 6243 Atomistic and Electronic Simulation of Materials

ME-GY 6253 Mechanics of Nanomaterials

ME-GY 6263 Mechanical Behavior of Materials

ME-GY 6323 Microscopy & Microanalysis

ME-GY 6413 Additive Manufacturing Fundamentals

ME-GY 6423 Additive Manufacturing of Metallic Materials

ME-GY 6433 CAD for Additive Manufacturing

ME-GY 6453 Security in Additive Manufacturing

ME-GY 6513 Advanced Dynamics

ME-GY 6603 Digital Control Systems

ME-GY 6613 Sensor Based Robotics

ME-GY 6623 Introduction to Robot Mechanics

ME-GY 6703 Linear Control Theory and Design I

ME-GY 6713 Linear Control Theory and Design II

ME-GY 6813 Energy Conversion Systems

ME-GY 6823 Energy Policy, Regulations, and Incentives

ME-GY 6833 Energy Project Financing

ME-GY 6843 Advanced Manufacturing of Biomedical Devices

ME-GY 6913 Introduction to Robot Mechanics

ME-GY 6923 Simulation Tools for Robotics

ME-GY 7003 Finite Element Methods

ME-GY 7063 Convective Heat Transfer

ME-GY 7073 Conductive Heat Transfer

ME-GY 7083 Radiative Heat Transfer

ME-GY 7113 Viscous Flow and Boundary Layers

ME-GY 7123 Turbulent Flow

ME-GY 7133 Compressible Flow

ME-GY 7153 Computational Fluid Mechanics and Heat Transfer

ME-GY 7163 Experimental Methods in Thermal-Fluid Sciences

ME-GY 7213 Elasticity I

ME-GY 7243 Advanced Composite Materials

ME-GY 7323 Failure Mechanics

ME-GY 7333 Non-Destructive Evaluation (NDE)

ME-GY 7353 Fracture Mechanics

ME-GY 7443 Advanced Vibrations

ME-GY 7613 Nonlinear Systems: Analysis and Control

ME-GY 7623 Cooperative Control

ME-GY 7703 Optimal Robust Control

ME-GY 7863 Special Topics in Mechanical Engineering

ME-GY 7873 Special Topics

ME-GY 7933 Fundamentals of Robot Mobility

ME-GY 7943 Networked Robotics Systems, Cooperative Control and Swarming

ME-GY 7953 Introduction to Smart Materials and Structures

ME-GY 7973 Optimal and Learning Control for Robotics

ME-GY 8033 Combustion

ME-GY 8043 Theory of Propulsion

ME-GY 8213 Elasticity II

ME-GY 8273 Mechanics of Cellular Materials

ME-GY 9013 Guided Readings I

ME-GY 9023 Guided Readings II

ME-GY 9033 Guided Readings III

ME-GY 9043 Guided Readings IV

ME-GY 9990 Seminar in Mechanical Engineering

ME-UY 498x Special Topics in Mechanical Engineering

ME-UY 1012 Introduction to Mechanical Engineering

ME-UY 2112 Computer Aided Design

ME-UY 2211 Statics Laboratory

ME-UY 2213 Statics

ME-UY 3211 Mechanics of Materials Laboratory

ME-UY 3213 Mechanics of Materials

ME-UY 3223 Dynamics

ME-UY 3233 Machine Design

ME-UY 3311 Fluid Mechanics Laboratory

ME-UY 3313 Fluid Mechanics

ME-UY 3323 Energy Systems

ME-UY 3333 Thermodynamics

ME-UY 3411 Automatic Control Laboratory

ME-UY 3413 Automatic Control

ME-UY 3511 Measurement Systems Laboratory

ME-UY 3513 Measurement Systems

ME-UY 3713 Manufacturing Systems I

ME-UY 4112 Senior Design I

ME-UY 4113 Senior Design II

ME-UY 4213 Design and Fabrication of Composite Materials

ME-UY 4214 Finite Element Modeling, Design and Analysis

ME-UY 4223 Vibrations

ME-UY 4311 Heat Transfer Laboratory

ME-UY 4313 Heat Transfer

ME-UY 4353 Internal Combustion Engines

ME-UY 4363 Heating, Ventilation and Air Conditioning

ME-UY 4373 Introduction to Nuclear Engineering

ME-UY 4383 Introduction to Radiation Physics and Dosimetry

ME-UY 4393 Nuclear Power Plant Systems

ME-UY 4623 Biomechanics

ME-UY 4633 Biomaterials

ME-UY 4643 Biofluid Mechanics

ME-UY 4653 Introduction to BioMEMS and Microfluidics

ME-UY 4713 Manufacturing Systems II

ME-UY 4853 Manufacturing Engineering and Processes

ME-UY 4863 Corrosion and Non-Destructive Evaluation of Materials

ME-UY 4983 Special Topics in Mechanical Engineering

ME-UY 4993 BS Thesis in Mechanical Engineering

Media Studies

MD-UY 2164W History and Social Impact of Mass Media Communications

MD-UY 2214W Cinema 1895-1950

MD-UY 2314 Interactive Narrative

MD-UY 3164W Critical Studies in Media

MD-UY 3214W Cinema 1948-2000

MD-UY 4164W Critical Studies in Digital Art

MD-UY 4911 Special Topics in Media Studies

MD-UY 4912 Special Topics in Media Studies

MD-UY 4913 Special Topics in Media Studies

MD-UY 4914 Special Topics in Media Studies

Music

MU-UY 2124 Western Music Theory

MU-UY 2214 Non-Western Music Appreciation

MU-UY 3134 Music Theory for Songwriters

MU-UY 3144 Music Since 1900

MU-UY 3214 The Musical Instrument

MU-UY 3314 Phonography

MU-UY 4114 Musical Informatics Studio

MU-UY 4211 Special Topics in Music

MU-UY 4212 Special Topics in Music

MU-UY 4213 Special Topics in Music

MU-UY 4214 Special Topics in Music

MU-UY 4314 Psychoacoustics

Philosophy

PL-UY 2004 Symbolic Logic

PL-UY 3004 Metalogic

Physics

PH-GY 955X Readings in Applied Physics

PH-GY 996X MS Project in Applied Physics

PH-GY 997X MS Thesis in Applied Physics

PH-GY 999X PhD Dissertation in Applied Physics

PH-GY 5343 Physical Basis of Nanotechnology

PH-GY 5443 Physical Techniques and Applications of Nanotechnology

PH-GY 5473 Modern Optics

PH-GY 5481 Modern Optics Lab

PH-GY 5493 Physics of Nanoelectronics

PH-GY 5543 Physics of Nanomaterials and Graphene

PH-GY 5553 Physics of Quantum Computing

PH-GY 5663 Physics of Alternative Energy

PH-GY 6153 Theoretical Mechanics I

PH-GY 6163 Theoretical Mechanics II

PH-GY 6243 Electromagnetic Theory I

PH-GY 6253 Electromagnetic Theory II

PH-GY 6403 Physical Concepts of Polymer Nanocomposites

PH-GY 6513 Introduction to Solid-State Physics I

PH-GY 6523 Introduction to Solid-State Physics II

PH-GY 6553 Advanced Quantum Computing

PH-GY 6633 Statistical Mechanics I

PH-GY 6643 Statistical Mechanics II

PH-GY 6673 Quantum Mechanics I

PH-GY 6683 Quantum Mechanics II

PH-GY 8013 Selected Topics in Advanced Physics

PH-GY 8023 Selected Topics in Advanced Physics

PH-GY 9531 Graduate Seminar in Physics I

PH-GY 9541 Graduate Seminar in Physics II

PH-UY 1002 Physics: The Genesis of Technology

PH-UY 1013 Mechanics

PH-UY 1213 Motion and Sound

PH-UY 1223 Electricity and Light

PH-UY 2023 Electricity, Magnetism and Fluids

PH-UY 2033 Waves, Optics and Thermodynamics

PH-UY 2104 Analytical Mechanics

PH-UY 2121 General Physics Laboratory I

PH-UY 2131 General Physics Laboratory II

PH-UY 2344 Introduction to Modern and Solid State Physics

PH-UY 2813 Astronomy and Astrophysics

PH-UY 2823 Introduction to Geophysics

PH-UY 3002 Junior Physics Laboratory

PH-UY 3054 Introduction to Polymer Physics

PH-UY 3103 Fundamentals of Applied Nuclear Physics

PH-UY 3234 Electricity and Magnetism

PH-UY 3244 Concepts of Nanotechnology

PH-UY 3424 Light and Lighting

PH-UY 3474 Introduction to Modern Optics

PH-UY 3503 Introduction to Radiation Physics and Dosimetry

PH-UY 3513 Nuclear and Radiation Instrumentation and Methods

PH-UY 3603 Mathematical Physics

PH-UY 3614 Computational Physics

PH-UY 3703 Mathematical Physics II

PH-UY 3801 Guided Studies in Physics

PH-UY 3802 Guided Studies in Physics

PH-UY 3803 Guided Studies in Physics

PH-UY 3804 Guided Studies in Physics

PH-UY 4124 Thermodynamics and Statistical Physics

PH-UY 4244 Techniques and Applications of Nanotechnology

PH-UY 4364 Introduction to the Quantum Theory

PH-UY 4444 Quantum Optics

PH-UY 4554 Solid State Physics

PH-UY 4601 Special Topics in Physics

PH-UY 4602 Special Topics in Physics

PH-UY 4603 Special Topics in Physics

PH-UY 4604 Special Topics in Physics

PH-UY 4902 Introduction to Senior Project in Physics

PH-UY 4904 Senior Project in Physics

PH-UY 4912 Senior Seminar in Physics

PH-UY 4994 Bachelor's Thesis in Physics

Prehealth

PHP-UY 4000 Preparations for Medical School

Psychology

PS-GY 997X MS Thesis

PS-UY 2724 Human Factors in Engineering Design

PS-UY 3164 Health Psychology

PS-UY 3324 Environmental Psychology

PS-UY 3724 Psychology of Sustainability

PS-UY 3754 Psychology of Living in Extreme Environments

Registrar

RE-GY 9990 PhD Qualifying Exam

Robotics

ROB-GY 5103 Mechatronics

ROB-GY 6003 Foundations of Robotics

ROB-GY 6103 Advanced Mechatronics

ROB-GY 6113 Microelectromechanical Sensors and Actuators for Robots

ROB-GY 6203 Robot Perception

ROB-GY 6213 Robot Localization and Navigation

ROB-GY 6313 Robotic Gait and Manipulation

ROB-GY 6323 Reinforcement Learning and Optimal Control for Robotics

ROB-GY 6333 Swarm Robotics

ROB-GY 6413 Robots for Disability

ROB-GY 6423 Interactive Medical Robotics

ROB-UY 2004 Robotic Manipulation and Locomotion

ROB-UY 3203 Robot Vision

ROB-UY 3303 Robot Motion and Planning

ROB-UY 3404 Haptics and Telerobotics in Medicine

Science and Technology

STS-UY 402X STS Global Experience

STS-UY 1004W Science, Technology, and Society

STS-UY 2004 Science, Technology, and Society

STS-UY 2134 Philosophy of Science and Technology in China and India

STS-UY 2144 Ethics and Technology

STS-UY 2214 Medical Ethics

STS-UY 2224 Science and Sexuality

STS-UY 2224W Science and Sexuality

STS-UY 2244W Magic, Medicine, and Science

STS-UY 2254 Evolution

STS-UY 2264W Addressing Public Policy Issues in the Sciences, Engineering and Medicine

STS-UY 2274 Space and Spacetime

STS-UY 2284 Introduction to FSTEM

STS-UY 2294 Quantum Mechanics and Information

STS-UY 2314 It's About Time

STS-UY 2324 From Heat Engines to Black Holes

STS-UY 2324W From Heat Engines to Black Holes

STS-UY 2334 The Invention of Race

STS-UY 2364 History of Aviation and Aviation Technology

STS-UY 2374 The Ship

STS-UY 2524 Computer Ethics

STS-UY 2534 Computers and Social Change

STS-UY 2554 Science and Pseudoscience

STS-UY 2604 Ethics and Engineering

STS-UY 2624W The Rhetoric of Science

STS-UY 2634 Psychology of the Internet

STS-UY 2644 Creativity and Innovation

STS-UY 2664 Intelligence: Real and Artificial

STS-UY 2724 Dinosaurs: Resurrecting an Extinct Species

STS-UY 2904 Special Topic in STS

STS-UY 3004W Seminar in Science and Technology Studies

STS-UY 3013 Directed Study in STS

STS-UY 3204 Science and Difference

STS-UY 3204W Science and Difference

STS-UY 3214 Science & Feminism

STS-UY 3214W Science and Feminism

STS-UY 3224 Queering Science and Technology

STS-UY 3254W Philosophy of Science

STS-UY 3264 Physics, Information and Computation

STS-UY 3284W Relativity and Spacetime

STS-UY 3354 Brain, Behavior, and the Mind: The History and Development of Neuroscience

STS-UY 3604 Psychology of Internet Security

STS-UY 3814 Social Psychology of Virtual Worlds

STS-UY 3904 Special Topic in STS

STS-UY 3914 Independent Study in STS

STS-UY 4002 Capstone Project I in Science and Technology Studies

STS-UY 4003 Study Abroad

STS-UY 4034 Internship

STS-UY 4202 Capstone Project II in Science and Technology Studies

STS-UY 4401 Independent Study in Science and Technology Studies

STS-UY 4504 Advanced Seminar in Science and Technology

Society, Environment and Globlization

SEG-UY 2124W Public Policy Issues and the Internet: A Global Perspective

SEG-UY 2184W Beyond Oil: Fueling Tomorrow's Vehicles

SEG-UY 2194W Writing About Nature and the Environment

SEG-UY 4504 Advanced Seminar in Society, Envirnmnt, & Globaliz

Transportation

TR-GY 900X Readings in Transportation

TR-GY 997X MS Thesis in Transportation

TR-GY 999X PhD Dissertation in Transportation Planning and Engineering

TR-GY 6013 Fundamental Concepts in Transportation

TR-GY 6021 Quantitative Analysis in Transportation

TR-GY 6053 Transportation Economics and Finance Fundamentals

TR-GY 6113 Forecasting Urban Travel Demand

TR-GY 6211 Economic Analysis of Transportation Alternatives

TR-GY 6223 Intelligent Transportation Systems and Their Applications

TR-GY 6231 Transportation Planning Principles and Practice

TR-GY 6313 Traffic Control and Signalization I

TR-GY 6323 Traffic Control and Signalization II

TR-GY 6333 Transportation & Traffic Concepts

TR-GY 6343 Traffic Operations & Control

TR-GY 6403 Transportation and Traffic Project

TR-GY 7013 Urban Transportation & Logistics Systems

TR-GY 7033 Multimodal Transportation Safety

TR-GY 7063 Stochastic models and methods for engineering systems

TR-GY 7073 Travel Behavioral Informatics

TR-GY 7123 Management of Urban Traffic Congestion

TR-GY 7133 Urban Public Transportation Systems

TR-GY 7213 Transportation Management

TR-GY 7223 Management of Transit Maintenance and Operations

TR-GY 7233 Transportation Management

TR-GY 7243 Intelligent Transportation Systems: Deployments and Technologies

TR-GY 7323 Design of Parking and Terminal Facilities

TR-GY 7343 Urban Freeways and Intercity Highways

TR-GY 7353 Data-driven Mobility Modeling and Simulation

TR-GY 8011 Special Topics in Transportation A

TR-GY 8013 Selected Topics in Transportation I

TR-GY 8021 Special Topics in Transportation B

TR-GY 8023 Selected Topics in Transportation II

Urban Studies

URB-UY 391x Independent Study in SUE

URB-UY 401X SUE Global Experience

URB-UY 2004 Global Perspectives on Urban Sustainability

URB-UY 2024 Design of Cities

URB-UY 2024W Design of Cities

URB-UY 2034 Humans in the Urban Environment

URB-UY 2044 Methods for Studying Urban Environments

URB-UY 2054 Introduction to Urban Policy

URB-UY 2054W Introduction to Urban Policy

URB-UY 2064 Introduction to Urban Planning

URB-UY 2114 Geographic Information Systems

URB-UY 2224 Natural Environment of New York City

URB-UY 2234 Natural Environmental Catastrophes and Cities

URB-UY 2334 Introduction to Environmental Sciences

URB-UY 3014 Directed Study in SUE

URB-UY 3034 Evidence-Based Design

URB-UY 3044 Green Cities

URB-UY 3044W Green Cities

URB-UY 3214 Cities in Developing Countries

URB-UY 3234 Planning for Healthy Cities

URB-UY 3314 History and Design of Urban Parks

URB-UY 3354 Urban Impact Assessment

URB-UY 3832 Special Topics in Sustainable Urban Environments

URB-UY 3834 Special Topics in Sustainable Urban Environments

URB-UY 4012 Capstone Project I

URB-UY 4014 Study Abroad

URB-UY 4022 Capstone Project II

URB-UY 4024 Capstone Project

URB-UY 4034 Internship

URB-UY 4504 Advanced Seminar in Urban Studies

Undergraduate Academics

UGA-UY 2000 TGL Sophomore Seminar

Undergraduate Academic Requirements and Policies

Program Areas

The NYU Tandon School of Engineering addresses the world of technology and its unique interactions with society. To fulfill its mission, NYU Tandon School of Engineering offers degree programs in five general academic areas:

- Computer Science and Engineering
- Engineering
- Sciences and Mathematics
- Technology, Culture, and Society
- Technology Management

Computer Science and Engineering

Computer science and engineering is an important and expanding field as today's society advances further into the Information Age. Computer science and engineering includes designing systems (computer hardware and software) and developing principles for applying computers to new uses. The field requires high levels of theory and practice and often involves developing or integrating complex software.

Computer science and engineering is a major element in modern information technology, allowing information to be used to analyze and solve problems in diverse fields, including telemedicine, heath care, finance, entertainment, manufacturing, telecommunications, transportation and biomedicine. Because of the breadth of its potential applications, computer science and engineering at NYU Tandon School of Engineering has a multidisciplinary focus.

The curriculum integrates basic science, computer science, mathematics, humanities and social sciences. Students take electives in technical and non-technical subjects, a mix that allows for flexibility and breadth in their studies at NYU Tandon.

The current faculty works in state-of-the art fields such as high-speed imaging, classification, software virus protection, high-speed graphics, text and data mining, fault-tolerant computing, database-management systems, software engineering, data compression, data security, parallel and distributed computation, scheduling theory, computer vision and Internet and Web technologies. This faculty experience, combined with a strong curriculum that integrates theory and practice, positions NYU Tandon graduates well for the 21st century.

Engineering

Engineering is the creation of devices and implements that can control or manipulate nature to produce a desired effect, applying science to build the infrastructure and tools society needs to improve the quality of life and the environment.

The modern engineer must have a firm background in the sciences and mathematics. Science reveals fundamental knowledge about the natural world. Mathematics comprises the language and tool used most often by engineers to analyze and manipulate that world. Additionally, a background in the liberal arts provides a fundamental understanding of society, its structures, needs and desires. No one can hope to improve society without such understanding. Engineers also must deeply appreciate the role they play in society, particularly in terms of their professional ethics and responsibilities. Finally, engineers must have excellent written and oral communication skills to work effectively with other engineers, professionals, decision-makers and the public.

NYU Tandon's engineering programs build on a firm foundation of mathematics and science to develop the analytic and conceptual skills required of a practicing professional. Laboratory classes introduce students to devices and systems currently used in their fields and help develop their skills in using computer-aided design packages. Undergraduate programs prepare students equally for entry into the profession and for continued education at the graduate level.

NYU Tandon, by giving students a comprehensive education in scientific and engineering principles and by developing creative skills required for engineering design and analysis, provides its graduates with the ability to continue to learn and grow in rapidly developing technological fields throughout their careers.

Current NYU Tandon faculty and alumni are advancing varied fields such as telecommunications, microwaves, imaging sciences, quantum electronics, pulsed power, smart materials, aerospace, robotics, geotechnology, biomedical engineering, financial and risk engineering, cyber security, gaming, software engineering and sensors and sensor networks. Through the School's engineering curriculum, students are equipped to advance this tradition forward to the next generation of technological breakthroughs.

The Sciences and Mathematics

Science and mathematics underpin modern technology. As scientists and mathematicians discover and describe secrets of the natural world, engineers look to apply them to developing new technology. Without the physical sciences and mathematics, engineers would have no tools with which to invent the technology of tomorrow.

NYU Tandon School of Engineering's undergraduate science and mathematics programs give students unique opportunities to study basic theory while interacting with design disciplines. The undergraduate program structure in these areas encourages students to select concentrations of elective courses in technology areas.

Students use modern laboratories and interact with faculty who are world-class researchers. Many upper-level classes are small, allowing students to develop one-on-one relationships with faculty and to work with them in their research areas.

The future of technology depends on the ability to develop a better and more accurate understanding of nature and its opportunities and constraints. For technology to advance, scientists must continue to unlock the secrets of the universe, and mathematicians must continue to develop the analytical and logical processes through which they can extend and apply what they investigate and discover. NYU Tandon programs prepare scientists and mathematicians for this vital role, enabling them to lead society to a better future.

Technology, Culture, and Society

Within the NYU Tandon School of Engineering, humanists, artists, and social scientists study the significance and impact of technology over time, and the relationship between technology and civic virtue. We fulfill that mission through majors in Integrated Digital Media (IDM), Science and Technology Studies (STS), and Sustainable Urban Environments (SUE), and liberal arts courses specifically designed to help engineering students understand the complex moral and social consequences of their work.

Technology Management and Innovation

NYU Tandon School of Engineering's Department of Technology Management and Innovation is the leading learning, research and development hub in the New York City/tri-state region, devoted explicitly to the critical arenas of innovation, information and technology management.

The department has achieved this distinguished position with a continuous stream of high-quality and relevant research, development and pace-setting learning programs. Its faculty contributes to theory and practice in an increasingly knowledge-intensive age.

The research and development conducted within the Department of Technology Management and Innovation is varied, including scholarly books and articles in respected journals and timely case studies. Some of this material forms part of the content in educational programs, helping to keep programs up-to-date and distinctive. The department is also committed to integrating technology into all educational programs to enhance learning. Because all managers must understand how technology and innovation are essential for delivering value to organizations and to the market, the department offers a portfolio of educational programs dealing with the broad spectrum of innovation, information and technology management in the modern economy.

In addition to its academic programs at the undergraduate, graduate and doctoral levels, the Department of Technology Management and Innovation offers short-term nondegree courses and workshops, including those tailored to the needs of specific firms and industries on contemporary topics in technology management.

Undergraduate Degree Requirements

This section details general institutional degree requirements applicable to all NYU Tandon School of Engineering undergraduate degrees. Academic departments may place additional requirements on individual degrees. Such additional requirements are explained in the program sections of this catalog. In no case may a department specify requirements less stringent than those indicated here.

Outcomes Assessment

NYU Tandon School of Engineering conducts outcomes assessments to monitor students' academic achievement, effective teaching methods, institutional improvements, and to ensure compliance with accreditation standards. To obtain periodic measurements of student perceptions and intellectual growth, undergraduate students are asked to participate in surveys, focus groups, interviews or related activities. While individual input is collected, the data from these assessments are published in aggregate form. Undergraduate students must complete online course surveys for all courses in which they are registered each semester (except guided studies and courses in which the enrollment is fewer than six students). Graduating seniors must complete exit surveys online. Any additions to or exceptions to this requirement are disseminated to the campus community each semester by the Office of Assessment and Institutional Research. Compliance with outcomes-assessment activities is traditionally a precondition for receipt of semester grade reports, transcripts, and degrees.

Basic Degree Requirements and Definition of Credits

Programs for the degree Bachelor of Science require 120 to 142 credits, depending upon the major as described in the program's section of this bulletin. Undergraduate semester credits are based on the number of 50-minute periods scheduled each week during one semester. Traditionally, one credit signifies a minimum of one 50-minute period of class work, or three 50-minute periods of undergraduate laboratory, over a period of 14 weeks, in addition to a final exam period. On occasion, more time per credit is given. The final examination period is an integral part of the semester.

Students may attend the University part-time or full-time. All undergraduate degrees can be completed in four years of full-time study. To earn the degree Bachelor of Science from NYU Tandon School of Engineering, students must satisfy University residency requirements. The majority of undergraduate courses are held during the day. A selection of evening undergraduate courses is available, but it is not possible to complete any undergraduate degree by taking courses entirely in the evening.

To earn a bachelor's degree, students must have a cumulative GPA of 2.0 or better in all courses at NYU Tandon School of Engineering; additional details can be found in the section regarding academic standing and probation. Certain programs have additional grade requirements in specified courses or groups of courses. Most undergraduate engineering curricula require students to participate in team projects, including participation in team-based design projects. Students must participate in outcomes assessment, as described below.

Selection of a Major

Undergraduate students admitted to the NYU Tandon School of Engineering are encouraged to declare their major upon admission, although incoming first-year students may initially enter as "undeclared" students. First-year students wishing to consider several program options are encouraged to use their first semester to explore major fields in consultation with departmental advisers. While the first year curriculum is nearly uniform for all engineering majors and very similar for other majors, students who choose to delay selecting their major until the end of the freshman year must select courses in consultation with their academic advisers.

Students are free to change their major at any time, given that their academic standing is acceptable to the program into which they wish to transfer. However, changes in major may involve loss of credit and additional time to complete the degree. Students entering NYU Tandon with an undeclared major must declare any currently offered undergraduate major by the end of their first year.

Double Majors

Tandon students are eligible to complete a second (non-primary) major in a distinct discipline other than their primary declared major, both within the Tandon School of Engineering and at other undergraduate schools of NYU (except the School of Professional Studies). Declaring a second major is an option for all undergraduate students at Tandon as long as they are in good academic standing and receive approval from authorized personnel from both academic departments. Specific requirements for each major are determined by the two departments' undergraduate academic advisers, undergraduate program directors, or department heads, in conjunction with the Tandon Office of Undergraduate Academics and the Tandon Office of Records and Registration. Students are required to complete all degree requirements for each major; some courses may be double counted towards both majors at the discretion of both academic departments.

Please note that Tandon students may not declare a second major at another NYU School if a similar major, in name and content, is offered at Tandon. For example, Tandon students may not double major in computer science at CAS. Similarly, Tandon students interested in completing a second major in math must declare the double major in math at *Tandon*. Tandon students may not double major in math at CAS.

It is important to be aware that declaring a second major will likely increase a students' time to completion at NYU and can impact financial aid. More information and instructions can be found on the NYU Tandon Non-primary (Double) Major Declaration form and the Double Major Completion form.

Selection of a Minor

A minor is an approved concentration of academic study within a single discipline. In specified programs, undergraduate students may select a minor in a field distinct from, or related to, their major, with approval of advisers in both the major and minor fields. The name of the minor appears on students' transcripts if the approved coursework in the minor field have been completed with at least a 2.0 GPA. With the consent of a student's major department, some courses used to satisfy the minor requirements also may satisfy the required or electives course requirements in the student's major program. The names and associated requirements for minors are listed in the sections of this bulletin devoted to related major programs.

NYU Cross-School Minors

Visit the NYU Tandon Minors webpage for more detailed information on the cross-school minors available.
NYU Tandon School of Engineering students have the opportunity to minor at other schools of NYU except the School of Professional Studies. (Likewise, students matriculated at the School of Professional Studies are not permitted to declare a minor offered at Tandon.) An undergraduate student may minor in a discipline not typically offered at NYU Tandon. If a similar minor, in name and content, is offered at the School, students must receive permission from the specific academic department at NYU Tandon offering the minor in order to enroll in such a minor at NYU. With the consent of a student's major department, some courses used to satisfy the minor requirements may also satisfy the required or electives course requirements in the student's major program. Students will follow all policies, procedures and academic time lines of the respective NYU school.

Students must consult their major academic adviser to determine the applicability of courses towards their NYU Tandon School of Engineering degree. Students will need additional credits than the minimum required to satisfy their degree requirements if courses taken for a minor at NYU do not meet the requirements specified by a student's program of study. When declaring a minor, students will indicate the courses they plan on completing for the minor. For each course taken, students must obtain approval from their NYU Tandon academic adviser as well as the corresponding academic department at NYU Tandon.

Note that declaration of a minor does not constitute guaranteed enrollment in all classes; registration timelines and deadline need to be strictly followed.

Course Placement Evaluation

NYU Tandon course placement evaluations are intended to ensure that each student receives the most pertinent instruction in areas necessary to successfully complete their degree program. Placement evaluations may supersede the results of Advanced Placement and International Baccalaureate examinations and/or acceptable transfer credits from another institution of higher education as determined by the designated adviser and the department offering the course.

Mathematics Diagnostic Examination

The Mathematics Diagnostic Examination is an extensive test to profile students' knowledge and skills in basic and advanced mathematics. The Mathematics Department uses the scores on various components of the exam to place students in relevant mathematics courses. Incoming first-year students (excluding those with AP credit) are placed into MA-UY 914, MA-UY 954 , MA-UY 1024, MA-UY 1054 , or MA-UY 1324.

Writing Placement

Incoming students will be automatically placed into EXPOS-UA 1 Writing the Essay. A first day in-class writing sample will be used to determine if any students should be changed to EXPOS-UA 4 International Workshop Writing I .

International students who are flagged for the English-language survey will be required to take an online diagnostic exam.

Writing and Speaking Across the Curriculum

NYU Tandon School of Engineering has adopted a Writing and Speaking Across the Curriculum program to ensure graduates develop satisfactory communications skills. This program ensures that significant writing and speaking assignments are included in designated coursework throughout students' undergraduate program and that course grades are influenced by the quality of presentation in addition to mastery of content.

To support this program, the Polytechnic Tutoring Center (PTC) houses the Writing Center for students; the Center is staffed by instructors, professional writers and qualified tutors. Students are encouraged to make an appointment to improve their writing and speaking skills.

Core courses such as EXPOS-UA 1, EXPOS-UA 2, EG-UY 1003, select humanities and social sciences electives, and all senior design projects are writing and speaking intensive. Each disciplinary curriculum identifies additional courses that fit into this category.

In addition to the required first-year writing curriculum, NYU Tandon students are required to complete 16 credits within the humanities and social sciences. One of these courses must be Writing-Intensive (designed with a "W"), and one must be at the 3000 or 4000 level. For more information about this requirement, and to see a list of courses, please refer to the Department of Technology, Culture and Society overview.

Core Curriculum

NYU Tandon School of Engineering's core curriculum is designed to provide all students with a solid education in the liberal arts, mathematics, basic sciences, and their major area of study. The goals of the core curriculum are to build students' critical, analytical, and communication skills; to build a strong foundation of knowledge; to introduce students to their major field of study; to expose students to other fields; and to prepare students for lives as responsible and engaged citizens. The core curriculum includes three areas of inquiry: (1) text, communication and social thought; (2) quantitative and scientific reasoning; and (3) innovation and problem solving.

ENGINEERING MAJORS: Areas of Inquiry

Area 1: Texts, Communication and Social Thought (24 credits)

- EXPOS-UA 1 Writing the Essay and EXPOS-UA 2 The Advanced College Essay
- Humanities and social science electives

Area 2: Quantitative and Scientific Reasoning (minimum of 34 credits)

- Mathematics: Every engineering student must complete a **minimum** of 16 credits of study in mathematics. The following mathematics courses are required of all engineering students:
  - MA-UY 1024 Calculus I for Engineers (or equivalent)
  - MA-UY 1124 Calculus II for Engineers (or equivalent)
  - MA-UY 2034 Linear Algebra and Differential Equations
- All engineering majors require a minimum of an additional 4 credits of mathematics coursework with required courses varying by major.
- Physics, Chemistry: The basic science core consists of **minimum** of 15 credits of study in the critical areas of chemistry and physics. The following basic science courses are required of all engineering students:
  - PH-UY 1013 Mechanics
  - PH-UY 2023 Electricity, Magnetism and Fluids
  - PH-UY 2121 General Physics Laboratory I
  - PH-UY 2033 Waves, Optics and Thermodynamics
  - PH-UY 2131 General Physics Laboratory II
  - CM-UY 1004 General Chemistry for Engineers
- Some engineering majors require additional coursework in the basic sciences. Refer to the List of Academic Programs and Curricula for specific degree requirements for each major.

Area 3: Innovation and Problem Solving (9-10 credits)

- EG-UY 1001 Engineering and Technology Forum
- EG-UY 1003 Introduction to Engineering and Design
- CS-UY 1133 Engineering Problem Solving and Programming or CS-UY 1114 Introduction to Programming and Problem Solving
- Introduction to Major

NON-ENGINEERING MAJORS: Areas of Inquiry

Area 1: Texts, Communication and Social Thought (24 credits)

- EXPOS-UA 1 Writing the Essay and EXPOS-UA 2 The Advanced College Essay
- Humanities and social science electives

Area 2: Quantitative and Scientific Reasoning (requirement varies)

- Mathematics
- Physics, Chemistry, Biology, or other natural science course

Area 3: Innovation and Problem Solving (requirement varies)

- CS-UY 1133 Engineering Problem Solving and Programming or CS-UY 1114 Introduction to Programming and Problem Solving
- EG-UY 1001 Engineering and Technology Forum
- EG-UY 1003 Introduction to Engineering and Design
- Introduction to Major

The New York State Education Department (NYSED) requires undergraduate students to complete a minimum of 60 credits in liberal arts and sciences for the Bachelor of Science degree. These liberal arts and sciences courses constitute a foundation or "general education" in the humanities, natural sciences and mathematics, and social sciences. These courses are intended to provide a basis of knowledge outside of specified occupational or professional objectives; these courses are not intended to emphasize the development of skills in areas such as technology or computer programming. All undergraduate majors at NYU Tandon School of Engineering fulfill the NYSED 60 credit liberal arts and sciences requirement through courses in expository writing, humanities and social sciences, mathematics, and science (areas 2 and 3, above).

Engineering Competencies

All NYU Tandon School of Engineering undergraduate engineering programs are accredited by the Accreditation Board for Engineering and Technology (ABET). ABET identifies the following eight General Criteria that every engineering program should address: (1) Students; (2) Program Educational Objectives; (3) Student Outcomes; (4) Continuous Improvement; (5) Curriculum; (6) Faculty; (7) Facilities; and (8) Institutional Support.

Modifications to Curricula

Course Substitutions

On occasion, the curricula changes to reflect the latest knowledge and methods within a subject area, especially in the science, engineering and technology areas taught at the NYU Tandon School of Engineering. Students are informed of these changes by their major department.

NYU Tandon School of Engineering responds to changes in curricula and course content by addressing special situations and circumstances. To that end, the School occasionally needs to substitute one course for another specified in the curriculum for students to meet degree requirements. A student documents such substitutions on an Adjustment of Degree Requirements form available from the Office of the Registrar's website. Each substitution must be documented and approved by the student's major adviser and the Office of Undergraduate Academics. If a graduation checklist has been issued at the time of the substitution, the change should be formally entered on the checklist and approved by the major adviser and the Office of Undergraduate Academics.

Interruption of Study

NYU Tandon School of Engineering graduates must fulfill degree requirements using courses that meet current standards in the field. Accordingly, students have up to eight years to complete the degree requirements in effect when they first enrolled in an NYU Tandon School of Engineering undergraduate degree program. This time limit is irrespective of any leave of absence granted during the eight-year period. As courses continuously evolve, the School may replace courses in the original degree requirements with comparable courses with updated content. Should the School establish a new set of degree requirements for new students, continuing students may choose to satisfy those requirements. In such cases, the Tandon School of Engineering decides which portion of the new requirements may be satisfied by the courses students have completed and also rules on modification, if any, of the original eight year time limit.

If a student has exceeded or is about to exceed the eight-year limit and has not yet finished their degree requirements, they need to appeal for an extension in order to finish the remaining courses.

To appeal, the student must consult with their academic adviser and fill out the "Extension of Time Limit to Complete Degree" form. All courses remaining in order to complete their degree must be listed and the time frame in which they will be completed.

The form should then be signed by their academic adviser and the Office of Undergraduate Academics before it is submitted to the Registrar's Office.

BS/MS Program

Undergraduates with strong academic records in certain programs may apply for admission to the BSMS Program, which leads to the award of both a Bachelor's and a Master's degree. While still undergraduates, this program allows students to make steady progress towards completing the two degrees for a lesser cost through a combination of earned AP credits, completed summer coursework, and additional credits over the limit completed each semester. Qualified students are typically considered for admission to the program during their junior year. In their remaining undergraduate semesters, they will complete some graduate coursework during regular terms and/or during the summer towards their desired MS degree.

Students interested in pursuing this option should speak with their undergraduate adviser as soon as possible. Some of the possible combinations of BS and MS majors available are described in the programs section of this bulletin. Students accepted to the BS/MS program are required to maintain a cumulative GPA of at least 3.5 for the duration of the undergraduate portion of the program and a 3.0 after matriculation into the graduate portion of the program; some departments may have higher GPA requirements. Students must graduate with a 3.5 cumulative GPA in the BS degree in order to move on to the MS program.

Additional information can be acquired from departmental advisers, including the specific sequence of courses necessary to complete the two degrees. International Students in F-1 or J-1 status must obtain permission and the necessary I-20/DS-2019 from the Office of Global Services before enrollment in the combined BS/MS program.

Honors Distinctions

Honor Societies

Students with superior academic records and co-curricular achievements may be selected to join one of the NYU Tandon School of Engineering's chapters of a national honors society in their junior or senior year. Closely allied to the professional and technical societies, these honors societies encourage and recognize outstanding scholarship and leadership.

Participating Societies at the NYU Tandon School of Engineering:

Chi Epsilon - Civil Engineering
Eta Kappa Nu - Electrical Engineering
Omega Chi Epsilon - Chemical Engineering
Pi Mu Epsilon - Mathematics
Pi Tau Sigma - Mechanical Engineering
Sigma Xi - Research
Tau Beta Pi - Engineering
Upsilon Pi Epsilon - Computing Sciences

Degrees with Honors

The NYU Tandon School of Engineering adheres to New York University's Latin Honors requirements. Latin Honors are given to Baccalaureate degree recipients who have achieved a high cumulative grade point average (GPA) and satisfied the school's residency requirements.

The GPA cutoffs for each category are determined by the combined GPA distribution from the preceding academic year. The cutoff for summa cum laude is the GPA included with the top five percent of the previous year's graduating class. The cutoff for magna cum laude is the GPA included within the next 10 percent of the previous year's class. The cutoff for cum laude is the GPA included within the next 15 percent of the previous year's class.

The cumulative grade point average and residency requirements for Latin Honors are published on the University Registrar's Latin Honors site. Please refer to the figures associated with the NYU Tandon School of Engineering.

Undergraduate Credits

Residency

To satisfy residency requirements for the BS degree, NYU Tandon School of Engineering students must complete a minimum of 64 credits at Tandon in approved coursework. Departmental advisers will assist students in selecting courses required for degree completion. In addition, students must complete their final 32 credits at the University, unless approved for a special term abroad. In regards to minors, one-half of the coursework must be completed at the NYU Tandon School of Engineering. All transfer credits are subject to the NYU Tandon School of Engineering's transfer credit policy and process.

Transfer Credits from other Undergraduate Institutions

Students who have completed undergraduate coursework at other universities prior to beginning their studies at NYU Tandon School of Engineering are encouraged to transfer credits over. NYU Tandon awards transfer credit for relevant courses completed satisfactorily at other accredited institutions. Students transferring into the NYU Tandon School of Engineering must have all outside transcripts examined by the Undergraduate Admissions Office and an adviser from their major department to determine the acceptability of individual substitutions and general acceptance of credits from their former institution(s). Much of this can be accomplished during the application process if the student's record is complete. All evaluations of transfer credits must be completed by the end of the student's first semester of registration at the NYU Tandon School of Engineering. Some programs may choose to delay approval of transfer credits until students demonstrate satisfactory progress at Tandon.

Undergraduate transfer credit is not given for any course in which a grade less than C has been earned. In addition, students completing a course at NYU Tandon for which transfer credit already has been given automatically forfeit the transfer credit for that course.

For new first-year students admitted to NYU, it may be possible to transfer college courses taken while in high school. Credit may be awarded if the following criteria are met: 1) Received a grade of B or better; 2) NYU offers corresponding courses; 3) Courses were not used to satisfy high school graduation requirements.

The contents and standards of courses vary from university to university. Thus, some transfer students find after a semester's work at NYU Tandon School of Engineering that they are better prepared for advanced courses if they re-enroll in a course at NYU Tandon for which they have been given transfer credit. Students may be required to enroll in such a NYU Tandon course after consulting with their academic adviser. In some instances, course requirements may be waived for students who demonstrate sufficient knowledge of specific course content through either written or oral examination given by the academic department offering such course. In such cases, no credit is awarded, but students are allowed to submit a more advanced course to satisfy degree requirements. This approach differs from "credit by examination," described later in this section.

Grades of courses for which transfer credit is given are omitted in computing a student's cumulative or current semester GPAs.

Dual Degree Program with the College of Arts and Science: The 3+2 Program

General Information

NYU's College of Arts and Science offers a dual-degree program in science and engineering with the NYU Tandon School of Engineering. This program affords highly qualified and motivated students who are technically oriented the opportunity to pursue both a liberal arts program with a major in science and a traditional engineering program. The program is ideal for students interested in science and engineering who are also eager for a liberal arts experience before entering an undergraduate engineering environment. Upon completion of this five-year program, students receive the Bachelor of Science degree from the College of Arts and Science at New York University and the Bachelor of Science degree from the NYU Tandon School of Engineering.

The available dual-degree combinations are as follows:

- BS in Biology/BS in Chemical and Biomolecular Engineering
- BS in Chemistry/BS in Chemical and Biomolecular engineering
- BS in Computer Science/ BS in Computer Engineering
- BS in Computer Science/ BS in Electrical Engineering
- BS in Mathematics/ BS in Civil Engineering
- BS in Mathematics/ BS in Computer Engineering
- BS in Mathematics/ BS in Electrical Engineering
- BS in Mathematics/ BS in Mechanical Engineering
- BS in Physics/BS in Civil Engineering
- BS in Physics/BS in Computer Engineering
- BS in Physics/BS in Electrical Engineering
- BS in Physics/BS in Mechanical Engineering

Detailed programs of study for each of the curricula are available from the NYU's College Advising Center, Silver Center, 100 Washington Square East, Room 905.

Students who are interested in this program apply directly to NYU's College of Arts and Science as a first year student, indicating their interest in this program on their application. Students that matriculate into Tandon as a first year student are ineligible to join. Application materials for this dual-degree program may be requested from the Office of Undergraduate Admissions.

The Academic Program

Students accepted into the program spend their first three years of study in the College of Arts and Science (CAS) at Washington Square (WSQ). In the first year at CAS, the different curricula call for many of the same courses. This gives students time to consult with faculty at both schools before committing themselves to a particular science/engineering major.

During freshman orientation, if they have not already done so, students select a major area for their study at CAS from the disciplines of biology, chemistry, computer science, mathematics, and physics. In their first year, students will have the opportunity to change this major and to reflect on their choice of engineering major. In the spring of the third year, an orientation program helps students prepare for the transition to NYU Tandon in the fourth year.

In the first three years of the program, students satisfy their core liberal arts requirements and also take some of the NYU Tandon School of Engineering courses required for their choice of engineering major. Students may elect to withdraw from the dual-degree program in engineering and complete only the College of Arts and Science general and major requirements at New York University. The final two years of study are undertaken at NYU Tandon School of Engineering's site in Brooklyn where students complete the remaining technical courses required for their engineering major.

Articulation Agreements

To provide students with alternative pathways to a BS degree from the NYU Tandon School of Engineering and to facilitate the transfer process, the School has developed cooperative programs with other institutions. Students completing approved programs at these institutions with sound academic achievement are guaranteed admission to the School. Students interested in learning more about the cooperative programs should contact the Office of Undergraduate Admissions. Currently, the NYU Tandon School of Engineering offers an articulation agreement with Brooklyn College.

Articulation with Brooklyn College

The present articulation between Brooklyn College and the NYU Tandon School of Engineering is for the first two years in the fields of Civil, Chemical, Computer, Electrical and Mechanical Engineering. Further information may be obtained from Brooklyn College or the NYU Tandon's Office of Academic Affairs.

Transfer Credits while in Residence

Undergraduates at NYU Tandon School of Engineering are expected to complete all coursework at the School. Exceptions are rare and only made in cases where NYU Tandon School of Engineering does not offer courses integral to the attainment of students' academic goals.

To obtain credit for courses taken elsewhere while enrolled at NYU Tandon School of Engineering, students must obtain written permission from the major academic adviser, the department head of the course for which transfer credit is requested and the Office of Academic Affairs. This must be done before registering for the course at another institution. Forms for such permission are available on the Registrar's website.

The following requirements apply to all courses taken outside of NYU:

- The outside institution must be accredited.
- Grades earned must be C or better for undergraduate courses.
- Pass/fail courses are not acceptable under any conditions.
- Only credits are granted; grades are omitted in computing cumulative or current semester GPAs.

Credit for Courses at Other Schools and Divisions of New York University

Undergraduate students at the Tandon School of Engineering may complete coursework in other undergraduate divisions of New York University and have credits for these courses applied to their degree.

Students may take a total of 4 courses or 16 credits in other divisions. Students seeking additional credits beyond the 4-course limit must inform their departmental advisor, who must request approval for these additional courses/credits via internal memo. Exceptions may be made for students in extenuating circumstances.

Courses in other divisions that duplicate the contents of a NYU Tandon School of Engineering course do not count toward degree completion. In addition, except in rare cases, coursework completed in another division cannot be used to satisfy a student's writing-intensive humanities and social science requirement. For this reason, students must meet with their departmental advisor before registering for any courses in other divisions. If a course is not approved, students will not receive credit for it. Independent study or internship courses taken in other divisions of the University in general do not count toward degree completion. Students are encouraged to consult with their academic advisor regarding applicability of such courses towards their degree requirements.

Your first cross-school minor, study abroad coursework, and courses offered at or by other schools that are required for a major here at Tandon do not count towards this 4 course/16 credit limit.

Also excluded from credit toward the degree are any courses taken in the School of Professional Studies once a student is matriculated in Tandon.

Undergraduate Validation Credits

When it is unclear whether a course taken outside of NYU Tandon School of Engineering is suitable for transfer credit, students may qualify for transfer credit by passing a validation examination. Permission to take such an examination must be recorded in advance on the student's transfer evaluation form at the time of application to NYU. The format of the examination is at the discretion of the department giving the course. Scheduling of the examination is by mutual agreement, but in no event more than one calendar year after the student begins study at the NYU Tandon School of Engineering. A grade of C or better is required to validate course credits for undergraduate students. An examination may not be taken more than once. Students who register for or attend the course at NYU Tandon School of Engineering forfeit the right to take a validation examination.

Advanced Placement and International Baccalaureate Credits

NYU Tandon School of Engineering grants students credit for approved Advanced Placement (AP) and International Baccalaureate (IB) courses in high school, given acceptable performance on AP and IB examinations. Students must request evaluation of AP and IB credits by no later than the end of their first semester of matriculation. Credit also may be granted for college preview courses at the NYU Tandon School of Engineering or other universities while a high-school student if these courses are relevant to the student's degree program and acceptable grades were achieved. Grades for advanced placement, international baccalaureate, or college preview courses are omitted in computing the cumulative or current semester GPAs.

Credit by Examination

Undergraduate students with an outstanding record or with specialized competence may establish a maximum of 16 credits toward the baccalaureate degree by passing comprehensive examinations. Each department determines the courses in which such an examination is available and the examination format. Students must obtain the approval of the department giving the course, the department of major study, and the Office of Undergraduate Academics.

A grade of B+ or better is required to achieve credit by examination. Students registering for or attending a course at the NYU Tandon School of Engineering may not subsequently take the examination for credit for the course or for a course with similar content. The examination may be taken only once.

Students pay a fee to the Office of Records and Registration before each examination and will receive the form to take the exam after making the payment. The course and credits are posted on student's permanent record without a grade and do not count toward the minimum-residence requirement for the bachelor's degree or toward the GPA.

Undergraduate Thesis

The undergraduate thesis allows students to apply knowledge gained in their major field of interest and use it to plan, conduct and report original research. The thesis may be a discourse upon a subject included in students' courses of study, an account of an original investigation or research, or a report on a project or an original design accompanied by an explanatory statement.

The undergraduate thesis is optional except for students in the Honors Program, who are required to complete an undergraduate thesis. All undergraduate students who plan to undertake a thesis should report to the head of their major department with their choice of a thesis topic at least one year before graduation. Department heads approve requests and appoint a thesis adviser. Students should contact their thesis adviser immediately and register for the thesis during the next registration period. Thereafter, the student must register for the thesis every fall and spring semester until it is completed and accepted and the final grade is entered into the student's permanent record. A student must take a minimum of 3 credits of thesis work for an undergraduate thesis.

Students must submit a bound BS thesis to the Office of Undergraduate Academics as outlined in the document entitled "Regulations on Format, Duplication and Publication of Reports, Theses and Dissertations," available in the Office of Undergraduate Academics. All theses and results obtained become the property of the School.

Internship Policies and Guidelines

The majority of undergraduate internship courses are designated by CP-UY. That being said, some departments have their own internship courses that are designated with the departmental subject area. Students should confer with their departments which course is the most suitable for their request.

These courses provide an opportunity for students to pursue internship and work experiences in varying fields of study that enhance and augment classroom learning, while also enhancing the overall educational experience by obtaining practical experience.

Eligibility and Requirements: Students

F-1 international students are required to complete at least two semesters of full-time study in the United States (U.S.) to be eligible for internship authorization. This may include time spent studying at another U.S. institution, including completion of a bachelor's degree immediately prior to studying at NYU. Please contact the Office of Global Services for details on F-1 internship eligibility.

Undergraduate students must have a cumulative GPA of at least 2.50, as reflected on their academic transcript. Students cannot enroll in internship courses if they have an incomplete grade in any course from a prior semester. Students cannot enroll in a subsequent internship course if they have an Incomplete or a Fail grade from a previous internship course.

Eligibility and Requirements: Work Experiences

During the academic year, work experiences must be at least 10 weeks long. During the summer, they must be at least 6 weeks long. Additionally, the work experience must be a minimum of 120 hours. Start and end dates need not coincide with the first and last day of the semester, but must fit within the semester in order to ensure that final reports may be submitted and grades may be submitted in a timely manner.

During the academic year, students cannot work more than 20 hours per week while classes are in session. During the summer, however, students are permitted to work full-time. Work hours should be discussed and agreed upon by the organization, the student, and the academic department.

Work experiences must comply with the Fair Labor Standards Act (www.dol.gov/whd/flsa). As such, students must be paid at least minimum wage unless specific exceptions apply. The Department of Labor outlines a six-point test (www.dol.gov/whd/regs/compliance/whdfs71.htm) regarding unpaid internships. Employers should consult their legal counsel for more information.

If receiving payment, students must be hired as employees of the participating organization and must be paid directly by the organization using a W-2 form. Employers cannot pay students as independent contractors using an IRS 1099 form.

Employers must agree to assign a responsible, ranking employee as the student's supervisor. This individual will provide appropriate supervision and mentoring, including establishing clear goals and expectations regarding tasks and projects. Employers must be willing to submit written midterm and final evaluations of the student's work. Experiences will not be approved for companies that are not permitted to submit written evaluations. Employer supervisors must review the student's final report so that proprietary and/or confidential information can be removed.

Procedures

Students should follow the procedures put forth by their academic department in order to receive approval for the internship and enroll in an internship course. Students must obtain an offer letter on organization letterhead from the prospective employer. This letter must identify the company, its address, contact information, the student's job title, and start and end dates of the internship.

Students will submit their offer letter and other required documents to their departmental adviser who will identify a suitable faculty adviser. The faculty adviser will be responsible for all academic matters related to the work experience. The faculty adviser will evaluate the relevancy of the work experience and, if approved, will direct the student to register for the appropriate internship course. Upon approval, departments must submit internship information to the Department of Undergraduate & Graduate Academics.

For approved International Students, the faculty adviser will provide the Office of Global Services (OGS) with all relevant information in order to process work authorization. International Students cannot begin working until they have received work authorization.

The company supervisor must provide a mid-term evaluation and a final evaluation to the faculty supervisor. The student will submit a project report at the end of the term. Some departments or programs may also require a presentation. The report (and presentation, if required) will be included as a part of the assessment for the student's grade. Faculty advisers will provide guidelines for the reports.

With the faculty adviser's approval, consecutive work experiences may be completed with the same employer. Students must complete the same registration process and follow all procedures for re-applying and enrolling in another internship course. International Students must obtain prior permission from OGS for every period of employment. Students are not authorized to work during the interim period between the end of their prior CPT and the beginning of their next even if they will have an internship with the same company; this jeopardizes their visa status.

Graduation

Graduation Checklist

Academic advisers of undergraduate students nearing completion of their degree requirements receive a graduation checklist that lists courses in progress and courses remaining to be completed for the degree. After the list is approved by the major academic department, the student receives an e-mail notifying them of their graduation status.

Application Process for the Bachelor of Science

To be awarded a Bachelor of Science degree at NYU Tandon School of Engineering, students must file a formal graduation application via the Albert Student Center. Application deadline dates are published on the University Registrar's website. Students who do not file by the published deadline date become candidates for the next conferral period.

Degrees are certified and diplomas issued three times a year, typically in January, May, and September. Commencement is held once a year, usually in May. All work for the degree must be completed and submitted before the graduation date.

Diplomas

Diplomas are mailed to the student about eight weeks after the degree conferral date. Diplomas are issued only once, subject to rare exceptions made on a case-by-case basis. Replacement diploma procedures and fees are published on the University Registrar's website. Replacement diplomas for the NYU Tandon School of Engineering will be printed with the school name at the time of the student's graduation.

Transcripts

The issuance of transcripts and generally the release of any information about a student are subject to the provisions of Public Law 93-380, the Family Educational Rights and Privacy Act of 1974, as amended. Unless NYU Tandon School of Engineering's disclosure policy permits otherwise, official transcripts of the scholastic record are issued only upon the submission of a written request or upon the submission of a signed release from the student.

Unofficial transcripts are available to students through the Albert Student Center. Those students without access to Albert may submit a written request for an unofficial transcript. A fee is charged for each unofficial or official transcript issued. Transcripts can be requested online.

NYU Tandon School of Engineering reserves the right to withhold a transcript if a student fails to meet financial indebtedness to the School.

Upon graduation, students should review their transcripts carefully and report any errors to the Office of the Registrar before the record is sealed.

Participation in Commencement

All students are permitted to participate in both the New York University Commencement Ceremony and the NYU Tandon School of Engineering Commencement Ceremony in May of each year.

There is a Dean's Exception for the All-University Commencement whereby graduation candidates who have no more than two courses outstanding to complete their degrees may petition their school's Dean of Student Affairs for eligibility to participate as long as these courses are completed by the end of the summer. Read more about the Dean's Exception policy and process on the NYU Commencement website.

The NYU Tandon School of Engineering will follow the same guidelines set by the Commencement Office for participation in the May ceremony as a Dean's Exception. That is to say, if a student is deemed a Dean's exception for University-wide Commencement Ceremony, they are also permitted to participate in the NYU Tandon School of Engineering Commencement Ceremony. Please note that students with more than two courses outstanding will not be granted an exception and will be able to graduate in either September or January dependent upon when they complete their degree requirements. Please visit the NYU Registrar's Graduation website for exact dates. Those students will then be able to participate in the May ceremonies of the following year.

Dean's Exception Forms will be available to NYU Tandon School of Engineering students at the Office of Student Affairs (LC 232) each spring semester.

Class Standing for Undergraduates

Students are classified at the end of each semester by the Office of the Registrar on the basis of earned and/or approved transfer credits beginning September 1, as follows:

Freshmen	1 - 31.5 credits
Sophomore	32 - 63.5 credits
Junior	64 - 95.5 credits
Senior	96 or more credits

Academic Year Full Time

Undergraduate students registered for 12 or more credits per semester are categorized as full time. The normal course load for full-time undergraduate students is 14-18 credits.

For certain types of attendance and enrollment certifications, some students who are registered for less than 12 (undergraduate) credits may be certified as full time-specifically undergraduates pursuing Institute-authorized full-time, full-semester co-op work assignments. A form to establish full-time equivalency is available from the Office of the Registrar's website.

Academic Year Part Time

Students registered for less than 12 credits per semester (except summer) are categorized as part time. Part-time students pay tuition at the prevailing per-credit rate and are ineligible for most financial assistance and scholarship programs.

Summer and Intersession

Students may register for up to 8 credits during each six-week summer term and for no more than 16 credits for the combined 12-week summer term. Six credits for a given summer term is considered full-time status.

Undergraduate International Students

Full-Time Status, Program and Degree Changes, Employment

To maintain non-immigrant student status, international students must enroll full time, taking at least 12 credits on the undergraduate level for each fall and spring semester. Moreover, they may only register for one online course per semester. Students wishing to take more than one online course per semester must obtain prior approval from the Office of Global Services (OGS). Students may take less than a full course of study if fewer credits are needed during the last semester to graduate or for valid academic and medical reasons. All reasons for exceptions must be approved in writing by OGS before the last day of late registration each semester so that courses can be added to students' schedules if necessary.

Students in F-1 and J-1 status must obtain written permission from OGS to withdraw from classes, if the withdrawal will result in less than a full-time course load, or to take a leave of absence. They must also obtain written permission and a pertinent I-20/DS-2019 form from OGS before enrolling in a new degree program. The process of withdrawing from a course, changing degree level, or taking a leave of absence through the Office of the Registrar keeps a non-immigrant student in good standing only with the School, but not with the U.S. Immigration and Citizenship Services (USCIS). In addition, students who plan to work as part of their coursework or as part of an internship placement are required to obtain prior approval from OGS for any such employment.

Failure to comply with the immigration requirements for full-time status, course withdrawals, degree changes, and/or leave of absence and employment violates the nonimmigrant student status and makes a student ineligible for any benefit of that status. According to the USCIS, lack of compliance may also result in deportation.

Policies on Undergraduate Grading and Grades

Computing the Grade-Point Average (GPA)

The Office of the Registrar determines the GPA of undergraduate students according to the following numerical values assigned to letter grades:

	Point Value	Description
A	4.000	Excellent
A-	3.667	Excellent
B+	3.333	Good
B	3.000	Good
B-	2.667	Good
C+	2.333	Satisfactory
C	2.000	Satisfactory
C-	1.667	Satisfactory
D+	1.333	Minimum Passing Grade
D	1.000	Minimum Passing Grade
F	0.000	Failure
S		Satisfactory

U	Unsatisfactory Progress
W	Withdrew Officially
I	Incomplete (converts to F after 180 days)
AUD	Auditor Status
P	Passing
NR	No record

In computing GPAs, NYU Tandon School of Engineering does not consider or count courses graded W, I, S, or U toward the total credits passed or earned. GPAs are computed by multiplying the numerical grade in each course by the number of credits for each course, adding these products for the courses taken and then dividing this sum by total number of credits represented by courses considered.

The W and I grades are described in greater detail in subsequent sections. Grades S or U are used to indicate progress in multi-semester research projects or theses, or for non credit-bearing remedial or other courses. Undergraduates enrolled in graduate courses may not receive grades of D or AUD.

Course Withdrawal: The W Grade

Students may withdraw from a course or courses without academic penalty until the published withdrawal deadline of the normal fall or spring semester. Students should process their own withdrawals online via the Albert Student Center. No approvals are required, but students are encouraged to consult with their academic advisers as withdrawing from certain courses may delay their planned graduation date. When the course duration varies from the norm, such as in six-, nine- or 12-week courses, withdrawal must be completed before two-thirds of the sessions are completed. Withdrawals must be processed online by 11:59 p.m. on the withdrawal deadline indicated on the published Academic Calendar. Withdrawn courses remain on the student's transcript with a grade of W and are not calculated into the GPA. Once entered on the student's record, a W cannot be changed to any other grade. An F grade is recorded for any student who ceases to attend a course without formally withdrawing in the required fashion by the required deadline. Students are also encouraged to consult with Financial Aid before withdrawing from a course, as it may affect their status and eligibility for aid.

Auditing Classes

Undergraduate students may be allowed to audit certain classes in order to fill the gap which may exist in their prior course work. Approval of the academic department is required prior to auditing a class. The credits for the course do not count as a part of the student's semester credit load. Students auditing a course will not receive a grade for the course and the course will be annotated by AUD without counting towards student's GPA calculations. Students who decide to audit a class must do so during their initial registration for the class by filling out the form available from the Office of the Registrar; this option cannot be changed once selected. Note that these courses must still be paid for.

Incomplete Grades

If a student cannot complete coursework at the requested time due to a valid reason, such as an illness or other critical emergency, the instructor may give a grade of Incomplete/I. In such cases, the instructor and the student must develop a detailed plan for completion which includes a specific completion date. Ordinarily, this date should not extend beyond the intersession, in fairness to students who finish course requirements on time and to ensure that students complete prerequisites for advanced courses. An I grade lapses into an F if the student fails to complete the work within the specified completion time line, or at most by 180 days after the end of the semester in which the I was given. All I grades must be converted before graduation.

The grade of Incomplete/I is used sparingly and only in cases with valid reasons, not merely because students have planned poorly or overloaded themselves. An I grade should not be issued if a student is unable to complete the course requirements without attending or participating in the course a second time. If the student re-registers for a course in which an I grade was given, the I grade lapses to an F. If successful resolution of an I grade would require the repetition of any course or portion of a course, the student should consider formally withdrawing from the course.

Change of Grade

Grades on file with the Registrar at the end of the semester, with the exception of incomplete (I) and temporary grades (S or U), are considered final unless an error in calculating or recording the grade is discovered. No correctly reported final grade may be changed based upon re-taking an examination or completion of additional work. Incomplete (I) grades are handled according to the policies described under Incomplete Grades. Temporary grades (S or U), used for continuing projects, thesis or dissertation, will be converted to standard letter grades upon completion of the project, thesis or dissertation. Once recorded with the Registrar, these grades are treated as all other final grades. If an error in calculating or reporting a grade is discovered, the instructor will submit the change of grade request to the Department Chair. Upon approval of the Department Chair, the request will be submitted to the appropriate Associate Dean for approval. Any incorrectly assigned grade must be corrected within one semester.

Repeating Courses

If an undergraduate student takes a course two or more times, only the second and subsequent grades will count toward their GPA. This policy holds regardless of the first and second grades earned, even when the second grade is lower than the first. The repeated course must be taken within one year of the first course, or at the first time it is offered, where a course is unavailable to repeat within one year. If the student first repeats the course more than one year after taking it initially, and the course has been offered, all grades earned in the course will be counted in the student's GPA. If a student earns a passing grade and subsequently fails the course, the passing grade can be used to satisfy degree requirements.

No undergraduate course may be repeated more than twice, for a total of three attempts. If a student earns an F grade in each of their three attempts in a prerequisite course or a degree requirement, the student is then academically disqualified.

Undergraduate Academic Standing and Probation

Dean's List

Undergraduate students who achieve a term GPA of 3.4 or higher in both the fall and spring semesters over the course of an academic year (Fall and Spring semesters only), with no grades of F, I or U for the semester, and are otherwise in good academic standing, are commended by the Office of Academic Affairs and placed on the Dean's List. This list is posted following the spring semester each year. Only those who complete 12 or more credits during the fall and spring semester are eligible. Students who include project courses in their 12 or more credit programs are also eligible, provided that these courses represent no more than one-half of the credit load for a given period and all of the aforementioned requirements are met. Non-degree credit courses, such as EXPOS-UA 13, may count toward the 12-credit requirement. The Dean's List notation appears on the student's permanent record. Students who receive a grade of F and then repeat the course in a subsequent semester, thereby excluding the first grade from the GPA calculation, are not eligible for the Dean's List. However, students who convert a grade of I to a regular letter grade or receive a change of grade after a given semester that would then qualify them for the Dean's List may retroactively receive Dean's List honors by bringing the change to the attention of the Office of Academic Affairs.

Any change of grade should be finalized within one semester to be considered for the Dean's list.

General Academic Standing

To remain in good academic standing, undergraduate students must maintain term and cumulative GPAs of 2.0 or greater. In addition, students must successfully complete a minimum number of credits for each semester of full-time study, excluding summers and mini-sessions. In the case of part-time students, a semester indicates the point at which 12 or more credits are undertaken. Thus, the first semester of study ends when 12 credits are accumulated; the second semester is calculated from that time onward until 24 credits are accumulated. According to these semester equivalents, grade-point requirements for part-time students follow those for full-time students.

The minimum number of cumulative credits to be achieved by the close of each semester of full-time study appears in the following table.

Minimum Credits and Minimum GPA Required by Semester of Full-Time Study

Number of Full-time Semesters Completed	Minimum Required Cum Grade Point Average	Minimum Credits to be Earned
1	1.50*	8
2	1.50*	16
3	1.50*	28
4	1.67	40
5	1.78	56
6	1.88	68
7	1.95	84
>8	2.00	96

* Any time a student's cumulative GPA falls below 1.5 they are placed on Final Probation regardless of how many credits they have completed.

In calculating the number of successfully completed credits:

1. Courses for which a student received an F grade do not count toward the minimum credits earned.

2. If a student receives an F grade in a course which they repeat within one academic year, their GPA will be recalculated using the second grade earned and the first grade of F will be removed from the GPA calculation.
3. Credits with an I grade will be counted toward enrollment for one year. Thereafter, any I grade that has not been changed by the instructor on record will automatically become an F grade.
4. Credits assigned a W grade do not appear in the calculation of credits undertaken, earned or successfully completed.
5. Transfer students will enter this table from the point at which their transfer credits place them.

A second requisite for enrollment is the maintenance of a 2.0 GPA or better or performance approaching 2.0 in a steady and realistic fashion. The table above contains the absolute minimum cumulative GPA to be achieved by the close of each semester of full-time or full-time equivalent enrollment.

The Office of Academic Affairs regularly monitors all undergraduate students, reviews their academic records after each semester, and informs students' academic adviser or other representatives from the their major department of the results of that review. Students identified as being in academic difficulty may not register for more than 12 credits per semester unless otherwise approved by their adviser. Students in academic difficulty are placed on academic probation following the steps and actions described below.

Academic Warning

Students whose midterm grades show they are in danger of failing a course receive e-mails of academic warning. The e-mails provide guidance for the student and invite them to meet with their academic adviser to discuss their academic performance and what steps to take to complete their course(s) successfully.

Academic Probation

Students are placed on academic probation when (1) their semester and/or cumulative GPAs fall below 2.0, but remain above the minimum standards as outlined above or (2) their number of successfully completed credits falls below the minimum standards as outlined above. Students falling into these categories are notified and directed to meet with their advisers. Students placed on academic probation are limited to a maximum of 18 credits per semester while on probation, unless otherwise approved by their adviser and the Office of Academic Affairs.

All first-year, first-time probationary students must enroll in SL 1020, the Academic Skills Seminar. The seminar consists of eight one-hour sessions, meeting weekly and taken on a pass/fail basis. SL 1020 helps students develop and enhance an awareness of their individual learning styles, study skills and time management techniques so they may be more successful students and return to good academic standing. Topics include establishing a mind-set for success, discussing career opportunities, setting goals, managing time, overcoming procrastination, learning study and test-taking skills and self assessing. SL 1020 is offered in small, interactive group sessions to support students as they develop strategies for academic success.

Final Probation

Students whose academic record indicates an unacceptable level of academic progress may be placed on final probation. Notified of their standing, these students must meet with their adviser to determine a study program and are limited to a maximum of 12 credits while on final probation to improve their academic performance. Should a final probation student need additional credits to satisfy the full-time requirement, he or she may be allowed to register for another course with the approval their adviser and the Office of Academic Affairs, but will be limited to a maximum of

14 credits. Academic Disqualification results from failure to improve performance and to meet the minimum progress requirements as outlined in the minimum-progress table above.

Disqualification

The Academic Standing Committee, comprised of members of the Office of Academic Affairs, faculty and a representative of the student's major department, shall jointly disqualify from the School any student whose cumulative GPA or number of credits successfully completed falls below the approved minimum shown in the above table for two consecutive semesters. Additionally, a major department may disqualify a student at or above the minimum listed if it is indicated that continuation will not lead to a successful completion of degree requirements. If a student is disqualified, they will be notified via e-mail.

Extenuating circumstances, such as serious medical problems (physical or psychological), must be documented by the Office of Student Affairs and can lead to a one-semester waiver of these criteria. Performance in the subsequent semester must meet minimum standards. Such arrangements must be made with the head of the major department and the Office of Student Affairs.

No undergraduate course may be repeated more than twice, for a total of three attempts. If a student earns an F grade in each of their three attempts in a prerequisite course or a degree requirement, the student is then academically disqualified.

Disqualification Appeal

Students who would like to appeal their academic disqualification may begin the appeal process immediately. Students must begin the disqualification appeal process a minimum of three weeks before the first day of classes of the semester immediately following their disqualification. If students do not begin the appeal process by this deadline they must wait until the next semester before they can reapply for readmission to the School and initiate the appeal process.

Leave of Absence and Withdrawal from the School

Leave of Absence

The NYU Tandon School of Engineering expects its students to maintain continuous registration in an academic program. However, the school recognizes that it is sometimes necessary or desirable for a student to take a leave from enrollment for a period of time. Should extenuating circumstances necessitate time away from the university, students are encouraged to consider a leave of absence. The duration of the leave will be a minimum of one academic semester, or an equivalent four month period, to a maximum of two academic semesters or the equivalent in months (8 months). A leave does not extend the time period permitted for obtaining a degree. The Leave of Absence policy may not be used in lieu of disciplinary action to address any violations of University rules, regulations, policies, or practices, nor may it be used in lieu of academic probation or disqualification.

Medical Leave of Absence

If a student and physician agree that a medical leave of absence is in the student's best interest, a physician should make a recommendation to the Associate Dean of Student Affairs at the NYU Tandon School of Engineering for a withdrawal from the semester and a leave of absence. To officially request a leave, the student must submit a Medical Leave of Absence Request Form, along with appropriate supporting documentation, to the Office of Student Affairs, which is located in the Dibner Building (5 MetroTech Center).

A request for a medical leave of absence must be accompanied by documentation from a health care provider and may require additional evaluation by the Medical Services Division of the Student Health Center. A leave is official only after the student receives final written approval from the Associate Dean of Student Affairs. This letter will clarify the steps necessary for reentry into the School of Engineering. Please feel free to contact the Office of Student Affairs (646.997.3918) regarding inquiries related to medical leave of absences.

Psychological Leave of Absence

If a student needs to request a psychological leave of absence, he or she must schedule an appointment with a counselor at the University Counseling and Wellness Services Center by calling 646.997.3456. Counseling and Wellness Services is located within the basement of Roger's Hall (6 MetroTech Center).

Should the student and counselor agree that a leave of absence is in the student's best interest, the counselor should make a recommendation to the Associate Dean of Student Affairs at the School of Engineering for a withdrawal from the semester and a leave of absence. To officially request a leave, the student must submit a Medical Leave of Absence Request Form to the Office of Student Affairs, which is located in the Dibner Building (5 MetroTech Center), Room LC 232.

A leave is official only after the student receives final written approval from the Associate Dean of Student Affairs. This letter will clarify the steps necessary for reentry into the School of Engineering. Please feel free to contact the Office of Student Affairs (646.997.3918) regarding inquiries related to psychological leaves of absences.

Personal Leave of Absence

A personal leave of absence may be requested for reasons unrelated to medical or psychological conditions. Personal leaves are voluntary and apply to issues related to national service or personal circumstances. The NYU Tandon School of Engineering is committed to handling requests for personal leaves in a reasonable manner. Please note that personal leaves will not be granted for graduate students who are not in good academic standing with the University.

To officially request a personal leave of absence, the student must submit a Personal Leave of Absence Request online via the Albert Student Center.

A personal leave is official only after the student receives final approval from the Office of the University Registrar. This letter will clarify the steps necessary for reentry into the NYU Tandon School of Engineering. Please feel free to contact the Office of Records & Registration regarding inquiries related to personal leave of absences.

Applying for a Leave of Absence

As a general rule, leave of absences must be requested prior to the first day of the classes. Thereafter, requests will be evaluated on a case-by-case basis. Please note that leaves are not granted retroactively for past semesters.

After the conclusion of the Drop/Add period, students withdrawing for the term will receive grades of W in all courses. The grade of Incomplete is not possible for a student on leave, and the student is not permitted to make up work for courses after a W is assigned, as it is a terminal grade. Students on leave of absence are not permitted to receive credit for any coursework completed outside of the university while on leave.

Returning from a Medical Leave of Absence

If the reason for a leave was medical or psychological, the student must follow the steps outlined in the letter provided by the Office of Student Affairs.

Returning from a Personal Leave of Absence

A student granted a personal leave of absence does not need to submit a formal application for readmission as long as he or she returns to the School within the agreed-upon time. Any student who fails to resume studies after the expiration of an approved leave of absence will be discontinued and would have to apply for readmission. Please note that readmission is never guaranteed.

Important Related Issues

Students should be aware that a leave of absence may affect financial aid, University housing, and future student status. While on leave, students are responsible for meeting all financial aid and housing deadlines relevant to returning students. Students receiving federal loans (SSL, SLS, and Perkins) should note that a leave of absence does not certify one as an enrolled student for the purpose of loan deferral. The contact information for relevant offices can be found below.

- NYU Housing - If you reside in University housing, you should contact the NYU Housing at housing@nyu.edu to determine how the leave may impact your housing license and future ability to participate in the housing lottery.
- Financial Aid - Students are advised to find out how the leave of absence may affect their scholarship and financial aid award. Please contact the Financial Aid Office within Student Link at the Dibner Building (5 MetroTech Center), Room 201 or at financial.aid@nyu.edu to clarify your responsibilities and status.
- Tuition - If a student is granted a leave after the semester has begun, the same graduated refund schedule applying to withdrawal from classes is in effect. For the graduated refund schedule and policies, please refer to the Refund Schedule posted online. The refund schedule is strictly enforced.
- Office of Global Services - International Students should contact the Office of Global Services immediately for information regarding visas and exit deadlines. Please contact OGS by visiting their office at the Dibner Building (5 MetroTech Center), Room 259 or by calling them at 646.997.3805 for more information.

Withdrawal

Total Withdrawal

Undergraduate students must notify the Office of Records and Registration if they elect to withdraw from the University prior to the published deadline and during a semester in which they are registered. No total withdrawal is official unless the online form, which is available via the Albert Student Center, is submitted and approved by the Office of the Registrar. Mere absence from courses does not constitute official withdrawal, but will lead to F grades recorded for courses not completed. To receive W grades for the semester, the withdrawal must be completed by the withdrawal deadline indicated on the academic calendar.

Involuntary Withdrawal

NYU Tandon School of Engineering is concerned about the health, safety and well-being of its students. Students judged to be a threat to themselves or to others may be withdrawn involuntarily from the Tandon School of Engineering. The School seeks, whenever possible, to allow such students to continue as active students if they agree to undergo professional care. Full details on this policy are available from the Office of Student Affairs.

Automatic Withdrawal

Undergraduates who do not file a formal leave of absence and who are not continuously enrolled are automatically withdrawn from the University. Students in this category must apply for readmission. If readmission is granted, students will be governed by the catalog and rules in effect at the time of readmission.

Readmission

Students applying for readmission must apply through the Office of Undergraduate Admissions. Applications for readmission will be sent to the student's academic department for evaluation. The academic department in consultation with the Office of Academic Affairs and Associate Dean of Academics will determine whether the student is eligible to continue his/her studies at NYU Tandon School of Engineering.

Graduate Academic Requirements and Policies

This section details the general School-wide degree requirements that apply to all NYU Tandon School of Engineering graduate degrees. Academic departments may place additional requirements on individual degrees. Such additional requirements are explained in the programs section of this catalog. In no case may a department specify requirements less stringent than those indicated here.

Outcomes Assessment

NYU Tandon School of Engineering conducts outcomes assessment activities to monitor student academic achievement, effective teaching methods and continuous improvement of the School, as well as to comply with accreditation standards. To obtain periodic measurements of student perceptions and intellectual growth, graduate students are strongly encouraged to participate in surveys, focus groups, interviews or related activities. While individual input is collected, data resulting from these assessments is published only in aggregate form.

Definition of Credits

Graduate studies are expressed in terms of credits. One 50-minute period of graduate class work for a 15-week, single semester carries 1 graduate credit. A standard graduate course meeting for two-and-a-half hours per week in a single semester of 15 weeks is equivalent to 3 credits. This format is the most common for graduate courses. Graduate laboratories meet three times per graduate credit (i.e., two-and-a-half-hours per week in a single semester of 15 weeks is equivalent to 1 credit). Courses meeting more or less than two-and-a-half hours each week are assigned credits in the correct proportion. The final examination period is an integral part of the 15-week semester.

Graduate Degrees and Advanced Certificates

Graduate Advanced Certificate Programs

NYU Tandon School of Engineering offers several graduate advanced certificate programs in specialized subject areas for students who do not wish to enroll in a full-degree program. Detailed descriptions of the certificate programs are available from the responsible departments.

Admission Requirements

Admission requirements for certificate programs are the same as those for related MS programs. Applicants must have a minimum undergraduate GPA of 3.0 or higher, and GREs are required from those applying for full-time study. Applicants must be admitted formally to a certificate program before beginning graduate course work.

Graduation Requirements

Depending on the program, 12 to 15 credits must be taken at NYU School of Engineering to earn a certificate, and no transfer credits for certificates are permitted. Courses taken for a certificate may be applied toward the future pursuit of an MS, ME, or PhD graduate degree, but not to another certificate program. Students must have a cumulative GPA of 3.0 in all graduate courses taken at the NYU Tandon School of Engineering to receive a certificate.

Students in such a program who subsequently decide to pursue a graduate degree must file a separate application for admission to the respective graduate program.

Master of Science

Admission Requirements

Admission to Master of Science programs requires a bachelor's degree and at least four years of college-level courses in a preparatory discipline from an institution acceptable to the NYU Tandon School of Engineering. An undergraduate GPA of 3.0 or better is required for admission. GRE scores are recommended for all applicants, and are required for anyone applying for full-time study or seeking merit-based scholarships. Applicants seeking admission to the MS in Integrated Digital Media are exempt from the GRE requirement, and those seeking admission to technology management-related degrees are encouraged to submit GMAT scores instead of the GRE. Letters of Recommendation, a Statement of Purpose, and a professional resume are also required from all applicants seeking admission to any graduate program.

Graduation Requirements

Candidates for the degree of Master of Science must complete no fewer than 30 credits of graduate courses and research beyond the bachelor's degree in the program selected. Academic departments may require additional credits for individual degrees. Individual programs may specify required courses, minimum GPAs in specific courses or course groups, or require a comprehensive examination, presentation of a seminar, or completion of a project or thesis. Specific course requirements for each MS program are detailed in the programs section of this catalog. To obtain the MS degree, students must maintain a cumulative GPA of 3.0 (equivalent to a B letter grade) or better in all graduate work undertaken at the NYU School of Engineering and any other school of NYU, including courses not used to fulfill specific program requirements. The average of B or better includes all guided studies, readings, projects, theses and dissertations. Students may use no more than a total of 3 credits of internship towards fulfillment of MS degree requirements. Students may offer no more than a combined total of 9 credits of project, guided studies, readings, or thesis toward fulfillment of the MS degree requirements. Students taking project or thesis must register for at least 3 credits of project or thesis every semester until the work is completed and a grade recorded (also refer to the section Maintenance of Studies).

MS students may elect to complete an MS project or MS thesis and may be required to do so in certain programs. Consult the programs section in this catalog for details. A project usually entails 3 to 6 credits, while an MS thesis is generally a more extended piece of research, usually entailing 6 to 9 credits. At this level, research should exhibit a thorough understanding of advanced scientific thought and an ability to apply advanced principles constructively to engineering planning and design.

Manuscript Presentation

Degree candidates must present their research to the appointed guidance committee in final manuscript form for official acceptance no later than two weeks before the end of the semester. The accepted format for the bound research document is detailed in the "Regulations on Format, Duplication and Publication of Project Reports, Theses and Dissertations." Detailed information is available on the NYU Tandon School of Engineering website.

Graduate students registered for MS thesis credits must submit four final bound copies to their department for necessary signatures, and then present them to the Office of Graduate Academics one week before the end of the semester.

Master of Engineering

Admission Requirements

All regulations and requirements for the Master of Engineering degree, including those governing admissions, graduation, and residency, are identical to those for the Master of Science degree.

Graduation Requirements

Candidates for the degree Master of Engineering must complete no fewer than 30 credits of graduate courses (including a maximum of 9 credits of research) beyond the bachelor's degree in the program. The Master of Engineering is for students seeking in-depth knowledge in fields requiring courses from multiple disciplines, especially those taught by several different academic departments. Students create their study program, including at least one graduate certificate, with the approval of a graduate adviser. A capstone experience is required for graduation.

Doctor of Philosophy

Admission Requirements

Students may apply to a doctoral program either directly after a bachelor's degree or after completing a master's degree. In either case, a GPA of 3.0 or better is required in all previous degree programs and a GPA of 3.5 or better is typically expected. GRE scores are required for all full-time PhD applicants. The admissions process for the doctoral program follows the same path as that of the Master of Science and Master of Engineering applications. Highly qualified candidates whose interests are incompatible with the faculty's research interests may not be admitted. Additionally, most departments admit only the number of students that they can financially support, and qualified candidates may not be admitted due to limited availability of funding.

Graduation Requirements

All doctoral candidates must complete a minimum of 75 credits of graduate work beyond the bachelor's degree, including a minimum of 21 credits of dissertation research (or more, depending on major). Requirements for the degree of Doctor of Philosophy are qualitative and quantitative. Students will find that the formal requirements of residence, course credits, and dissertation provide a framework within which they are free to construct individual programs for creative learning at an advanced level. Students must satisfy the detailed requirements of the selected degree program.

Each PhD student must complete a PhD dissertation. Research at this level must demonstrate critical and constructive thought, as well as the ability to use the techniques necessary to explore and develop new knowledge in mathematics, science, or engineering. A successful dissertation must demonstrably advance the subject area of research. School requirements for dissertations set a minimum of 21 credits of registration. All research should be characterized by accuracy of observation and measurement, and by clarity and completeness in presentation. The conclusions presented must be supported by adequate studies and investigations, and supplemented by a complete bibliography.

Graduate students in a PhD program should confer with an adviser in the department of major interest regarding: 1) selection of courses; 2) major and minor fields of study; 3) formulation of a guidance committee; 4) qualifying and language examinations; 5) degree candidacy.

Students in a PhD program must take and pass doctoral qualifying examination(s) administered by their major department. These examinations are generally scheduled once or twice yearly, and students should consult their academic department for further information. Students are highly encouraged to take the examination(s) in their first year of the program, and they may not register for dissertation research until they have passed the examination(s). If students have not passed by the end of their second year, they may be disqualified from the PhD program. Within six months of passing the examination(s), students and their dissertation adviser must form a dissertation-guidance committee that will oversee course selection, provide research guidance, and ensure that satisfactory progress is being made toward completion of the dissertation in a timely manner. Course selection must ensure that requirements of major and minors set forth by the respective programs are met. The committee, at its discretion or bound by departmental regulations, may require students to present a dissertation research proposal. The committee is expected to meet at least once per semester to assess student progress, and doctoral students must defend their dissertation in front of this committee. Doctoral students must obtain a checklist of the milestones and requirements for the PhD program from the Office of Graduate Academics.

All doctoral students must maintain a GPA of 3.0 or better at all times and a B or better for the dissertation, and some departments have further specific course or grade requirements that must be fulfilled. Once students begin their dissertation research, they must register for at least 3 credits of dissertation every semester until the dissertation is completed and successfully defended (also refer to the section on Maintenance of Studies).

Manuscript Presentation

Degree candidates must present their research to the appointed guidance committee in final manuscript form for official acceptance no later than two weeks before the end of the semester. The accepted format for the bound research document is detailed in the "Regulations on Format, Duplication and Publication of Project Reports, Theses and Dissertations." Detailed information is available on the NYU Tandon School of Engineering website.

Graduate students registered for PhD dissertation credits must submit four final bound copies to their department for necessary signatures and then present them to the Office of Graduate Academics one week before the end of the semester.

Publication

Doctoral dissertations are published by UMI Dissertation Publishing (ProQuest). The cost of this service is charged to the student. Publishing with UMI ensures that the dissertation thesis gains the widest possible audience. Any interested person can purchase copies of a dissertation through the company's website.

The faculty regards publication of the major content of a doctoral dissertation in a recognized scientific journal as a necessary final step if the work performed is to achieve maximum usefulness. The publication must indicate, by footnote or otherwise, its basis as a New York University School of Engineering dissertation.

Graduate Credits and Requirements

Residency

To satisfy residency requirements for a graduate degree at the NYU Tandon School of Engineering, students must complete the following minimum number of credits at the School:

- Graduate Certificate: All credits (12-15, depending on certificate)
- Master of Science: Total number of credits required, less 9 (at least 21 credits of residency)
- Master of Engineering: Total number of credits required, less 9 (at least 21 credits of residency)
- Doctor of Philosophy: 27 credits (including all dissertation credits)

Transfer Credits

Applications for transfer credits must be submitted for consideration before the end of the first semester of matriculation. Courses with grades below B are not eligible for transfer. Transfer credits for courses taken after matriculation at the NYU Tandon School of Engineering are rarely accepted and must be approved by the student's academic department and by the Office of Graduate Academics before the course is taken. Grades for transferred credits or courses are not recorded and are not included in GPA calculations.

Certificates

No transfer credit is permitted for graduate certificates.

Master of Science and Master of Engineering

A maximum of 9 credits may be accepted as transfer credits towards an MS or ME degree. Transfer credits must be approved by the student's department, the Associate Dean for Graduate Academics, and the Office of the Registrar. Courses that have been counted towards an awarded undergraduate or graduate degree, whether taken at NYU or another institution, may not be transferred toward a master's degree at the NYU Tandon School of Engineering. Credits submitted for consideration must be: 1) from accredited institutions; 2) consistent with NYU Tandon School of Engineering's residency requirements; 3) completed with grades B or better; 4) consistent with the curriculum in which the student is registered; 5) taken after receipt of a bachelor's degree, with the exception of NYU Tandon School of Engineering's undergraduate students (See section: Transfer Policy Exceptions: NYU Tandon Undergraduate Students). Theses, projects and guided studies or readings courses cannot be transferred.

Doctor of Philosophy

Doctoral students may transfer a blanket 30-credits from a prior MS degree. For the blanket 30-credit transfer, the prior MS need not be a 30-credit MS, so long as an MS degree (or equivalent) was granted, and a copy of the degree and detailed transcripts are presented. Additional courses taken after receipt of a bachelor's degree, but not counted towards an awarded degree may be eligible for transfer, up to a maximum of 18 credits. Additional courses individually transferred cannot include project, thesis, dissertation, guided studies or readings, or special topics credits. The total number of transferred credits for the PhD degree may not exceed 48. Some programs have additional restrictions; students should also consult the program specific portion of the bulletin for further information.

Transfer Policy Exceptions

NYU Tandon School of Engineering Undergraduate Students

While transfer policies normally preclude the transfer of graduate credit taken prior to the receipt of a bachelor's degree, an exception is made for NYU students who take graduate courses while pursuing an undergraduate degree at any school of NYU. Such graduate courses may be applied subsequently to a graduate degree at NYU Tandon provided that students earned a B grade or better, that the individual courses were not used to fulfill requirements for the undergraduate degree, and that the courses are acceptable based on the particular graduate degree curriculum requirement.

The sum of transfer credits from other institutions and internal transfer credits from other NYU schools (including graduate courses taken while matriculated as NYU undergraduates) cannot exceed the total number of transfer credits permitted for Advanced Certificates, MS and PhD degrees as specified above in the section on "Transfer Credits."

These exceptions to the Transfer Policy are effective for any student admitted for the Spring 2017 semester forward.

NYU Tandon School of Engineering BS/MS Students

NYU Tandon School of Engineering students enrolled in a joint BS/MS program with a study plan pre-approved by an academic adviser may take graduate level courses prior to receiving their bachelor's degree, and may apply these courses towards the requirements of their MS program without credit restriction. Graduate courses used to satisfy undergraduate degree requirements, however, cannot be used to satisfy graduate degree requirements. BS/MS students must maintain a minimum 3.0 CGPA in all graduate level courses, or they risk being disqualified from the BS/MS program.

Period of Validity

Graduate courses reflect the current state of the art in their respective fields. Thus, all courses that are more than 10 years old at the beginning of graduate study at NYU Tandon School of Engineering, whether taken previously at the School or at another institution, are ineligible for transfer and will not count towards the satisfaction of degree requirements. The blanket 30-credit transfer of an MS degree taken at the NYU Tandon School of Engineering or elsewhere towards a PhD program is exempt from this period of validity and does not expire.

Graduate Validation Credits

When it is unclear whether a course taken outside the NYU Tandon School of Engineering is suitable for transfer credit, students may qualify for transfer credit for that course by passing a validation examination. Permission to take the examination must be recorded in advance on the student's transfer-evaluation form. The examination format is at the discretion of the department giving the course. Scheduling of the examination is by mutual agreement, but in no event can it be scheduled more than one calendar year after the student begins study at NYU Tandon School of Engineering. A grade of B or better is required for graduate students. An examination may not be taken more than once. A student who registers for or attends the course at NYU Tandon School of Engineering forfeits the right to take a validation examination.

The sum of validation credits and transfer credits is limited to 9 credits for the MS and ME degrees.

One exception to the paragraphs above regarding transfer credit and graduate validation credit: Mathematics graduate students (MS and PhD) will be permitted, with adviser approval, to exceed the 9-credit limit on transfer credits and validation units by taking specified, adviser-approved courses at the Courant Institute of NYU. In the case of MS students, such approval may not raise the number of such courses above four.

Maximum Time for Completion

Certificate Students

Graduate certificate programs must be completed within 3 years from the time of admission to graduate studies at NYU Tandon.

MS and ME Students

MS and ME degree programs must be completed within 5 years from the beginning of graduate studies at NYU Tandon.

PhD Students Admitted Prior to Spring 2019

PhD programs must be completed within 6 years for full-time students and 12 years for part-time students, counting from the time of admission to graduate studies at NYU Tandon (not from the beginning of PhD studies).

PhD Students Admitted as of Spring 2019

Full-time PhD students transferring in 24 or more credits are granted 6 years to complete their PhD studies, counting from the time of admission into the PhD program at NYU Tandon. Full-time students transferring fewer than 24 credits have 7 years to complete the PhD program, counting from the time of admission into the PhD program. Part-time PhD students must complete all requirements for the PhD within 9 years, counting from the time of admission into the PhD program.

Extensions of these time periods are rarely granted and require prior approval from the Associate Dean of Graduate Academics. Students must request an extension at least 60 days prior to the deadline for completion. If an extension is granted, not all courses taken previously may count towards the degree. The Associate Dean, consulting with the department, will prepare a plan for the student to follow to obtain the degree.

Graduate Registration Policies

All graduate students must be registered for a minimum of 1.5 credits each fall and spring semester until they graduate. However, if students begin an MS project or thesis, or a PhD dissertation, they must register for at least 3 credits of project, thesis, or dissertation every fall and spring semester until it has been completed and accepted. Thus, while students who have not previously enrolled in research credits may satisfy registration requirements and maintain their student status by registering for 1.5 credits, students who have begun a project, thesis, or dissertation in a previous semester and who have not yet completed must register for a minimum of 3 credits (of research) each fall and spring until complete. (Also refer to the section on Maintenance of Studies.)

Graduate Registration Status

Graduate students pay tuition at the per-credit rate. Full-time status is defined by the following:

- Full-time MS students must be registered for 9 credits or more each semester. Students who are normally full-time may register for fewer credits during their last semester by registering for only the number of credits necessary for graduation. During this last semester they are part-time, but can be treated as full-time-equivalent for immigration purposes only (not for the purpose of financial aid eligibility) by requesting full-time-equivalency status from the Office of Global Services.
- Full-time MS students in the lock-step, cohort-based, executive-format MS programs are registered for all courses specified by the program as published in the catalog each semester. These programs require distinct courses and/or projects, each bearing credits approved for the program.
- Prior to passing the qualifying exam, full-time PhD students must register for a minimum of 9 credits per term. Upon passing the qualifying exam, students may maintain full-time status by registering for a minimum of 3 credits of dissertation per semester. Students who are not officially enrolled in a PhD program, irrespective of whether or not they have passed the qualifying exam, must continue to take a minimum of 9 credits per semester until they are formally admitted to a PhD program.

A status of non-matriculated or visiting student allows students to take up to three graduate courses at NYU Tandon School of Engineering (maximum of 2 courses or 6 credits per semester) without formally applying for admission to a graduate program. If these students desire to continue at NYU Tandon School of Engineering as matriculated students in a graduate degree or certificate program, they must follow the formal application process, and admission is not guaranteed.

Maintenance of Studies

M.S. Students: Upon completing the number of MS thesis/MS project credits required by their department, students may enroll in Maintenance of Studies (MOS) for one semester in lieu of enrolling in more thesis/project credits. If the remaining work is not completed after one semester of MOS, students must resume enrollment in thesis/project credits in the following term and all subsequent terms until the thesis/project is complete. Once students elect to enroll in MS thesis/MS project, they must continue to enroll in research credits or MOS every semester until completion, even if they are taking other courses that will maintain their student status in the same semester. However, summer enrollment in thesis/project or MOS is only required if students plan to graduate in the summer term.

Ph.D. Students: Upon completing 75 credits towards the Ph.D. and all required dissertation credits, Ph.D. students may continuously enroll in MOS every semester until all remaining work for their dissertation is complete. Summer enrollment in dissertation credits or MOS is only required if students plan to graduate in the summer term.

Modifications to Curricula

Curricula and courses change from time to time in order to keep students abreast of the latest knowledge and methods within subject areas. Students are required to satisfy the curriculum and degree requirements in effect at the time of their matriculation and must obtain current degree requirements from their program adviser.

In order to accommodate curriculum and course revisions, it is sometimes necessary to substitute a course for one specified in the curriculum. Students may also request course substitutions to tailor their studies to their interests. Both the program adviser and the Office of Graduate Academics must approve all course substitutions.

Graduate International Students

Full-time Status, Program and Degree Changes

To maintain non-immigrant student status, international students must maintain full-time status every fall and spring semester for the entire semester (i.e., withdrawing from a course during the semester may jeopardize full-time status). Students are not required to enroll during the summer semester and may enroll for credits at their discretion. International students may register for online courses, but must be registered for a minimum of 6 credits of on-ground course work per term. All questions concerning this regulation should be addressed with the Office of Global Services (OGS). Students may take less than a full course of study if fewer credits are needed during the last semester prior to graduation, but they must notify OGS prior to the beginning of the semester and obtain full-time equivalency status. Students may qualify for a reduced course load (RCL) for valid academic and medical reasons. All exceptions must be approved by OGS before the last day of registration (the add/drop deadline) each semester so that courses can be added to the student's schedule if necessary. Only one semester of reduced course load (RCL) for academic reasons is permitted per degree level.

Students in F-1 and J-1 status must obtain written permission from OGS for any Leave of Absence request, or to withdraw from classes if the withdrawal results in less than a full course load. They also must obtain written permission and the pertinent I-20/DS-2019 form before enrolling in a new degree program. The process of withdrawing from a course, changing programs, changing degree level, or taking a Leave of Absence through the Office of the Registrar keeps a non-immigrant student in good standing only with the School, but not with the U.S. Citizenship and Immigration Services (USCIS), unless proper approval is obtained from OGS. Students planning on employment as part of their course work must obtain prior approval from OGS for any such employment.

Failure to comply with the immigration requirements for full-time status, course withdrawals, program changes, degree level changes, or Leave of Absence violates the non-immigrant student's status and renders a student ineligible for any benefit of that status. According to USCIS, lack of compliance may also result in deportation.

Policies on Grading and Grades

Computing the Grade-Point Average for Graduate Students

For the purposes of computing GPAs for graduate students and graduate courses, the following schedule is used.

Grade	Point Value	Description

A	4.000	Excellent
A-	3.667	Excellent
B+	3.333	Good
B	3.000	Good
B-	2.667	Good
C+	2.333	Deficient, but Passing
C	2.000	Deficient, but Passing
F	0.000	Failing
P		Pass (no GPA value)
S		Satisfactory
U		Unsatisfactory
W		Withdrawal
I		Incomplete, converts to F after 180 days
AUD		Audit

Grades S and U reflect progress on research efforts. Once the thesis or dissertation is completed, the letter grade is entered on the transcript for all research registrations. Noncredit seminar courses are graded P or F. Other than research credits, no credit-bearing courses can be assigned S or U grades. A student cannot graduate if a grade of U is on the transcript for any credit-bearing course or for research efforts at the time of graduation. A grade of I cannot be assigned to a course that is graded S or U. Grades S, U, I, W and AUD are not included in computing the GPA.

Graduate Bridge and Preparatory Courses

Many programs offer graduate bridge or preparatory courses to accommodate the needs of students who lack certain undergraduate preparation. Generally, bridge or preparatory courses cannot be used to satisfy degree requirements, particularly for degrees within the department that offers the course. However, these courses are included in the calculation of a student's graduate GPA. Some graduate students may be required to take certain undergraduate courses as preparation for advanced graduate study. Undergraduate courses are not included in the student's GPA calculation.

Repeating Courses

The first time a graduate student repeats a course, the lower grade is not counted towards the GPA. All subsequent grades in a course repeated more than once are included in the GPA, although degree credit is earned only once.

Course Withdrawal: The W Grade

Students may withdraw from a course or courses without academic penalty until the published withdrawal deadline of the normal fall or spring semester. Students should process their own withdrawals online via Albert Student Center during the first two weeks of the semester. After the first two weeks, students must complete a paper add/drop form and submit the form to the Office of Graduate Academics. In all cases, students are encouraged to consult with their academic advisers, as withdrawing from certain courses may delay their planned graduation date, and international students should make sure that they do not drop below full-time status (9 credits). Students who have been placed on final academic probation are not permitted to withdraw from courses without prior approval from the Office of Graduate Academics.

When the course duration varies from the norm, such as in six-, nine- or 12-week courses, please consult with the NYU Tandon SOE Records and Registration Office for deadline information. Withdrawn courses remain on the student's transcript with a grade of W and are not calculated into the GPA. Once entered on the student's record, a W cannot be changed to any other grade. An F grade is recorded for any student who ceases to attend a course without formally withdrawing by the required deadline.

International students who wish to withdraw from a course, or courses, must have prior approval from OGS if withdrawing will leave them with fewer than nine credits of registration.

Auditing Courses

Graduate students may audit courses instead of receiving credits and grades for them. Regular tuition is charged and courses are treated as part of a full-time load. An AUD notation is made on the student's permanent record.

Interested graduate students should see their advisers and must notify the NYU Tandon SOE Office of Records and Registration within the first two weeks of the semester if they select courses for audit status. Under no circumstances may an audit status be changed to credit status once elected. Audited courses do not count toward satisfying graduation requirements.

Incomplete Grades

If a student cannot complete the course work at the usual time because of valid reasons, such as illness or other critical emergency, the instructor may give a grade of Incomplete/I. In such cases, the instructor and the student must develop a detailed plan for completion that includes a specific completion date. Ordinarily this date should not extend beyond the intersession, in fairness to students who finish course requirements on time and to ensure that students complete prerequisites for advanced courses. An Incomplete grade converts to an F if the student fails to complete the work within the specified completion timeline, or at most by 180 days after the end of the semester in which the student was enrolled in the course. All Incomplete grades must be converted before graduation.

The grade of Incomplete/I is used sparingly and only in cases with valid reasons, not merely because students have planned poorly or overloaded themselves. An Incomplete grade should not be issued if a student is unable to complete the course requirements without attending or participating in the course a second time. If the student reregisters for a course in which an Incomplete grade was given, the Incomplete grade lapses to an F. If successful resolution of an Incomplete grade would require the repetition of any course or portion of a course, the instructor should not assign an Incomplete, and should instead counsel the student to withdraw from the course.

Change of Grade

Grades on file with the Registrar, with the exception of Incomplete/I grades and temporary grades (S or U), are considered final unless an error in calculating or recording the grade is discovered. No correctly reported final grade may be changed based upon re-taking an examination or completion of additional work. Incomplete/I grades are handled according to the policies described under Incomplete Grades. Temporary grades (S or U), used for continuing projects, thesis or dissertation, will be converted to standard letter grades upon completion of the project, thesis or dissertation. Once recorded with the Registrar, these grades are treated as all other final grades. If an error in calculating or reporting a grade is discovered, the instructor will submit the change of grade request to the Department Chair. If approved by the Department Chair, the request will be submitted to the Associate Dean for Graduate Academics for consideration. Any incorrectly assigned grade must be corrected within one semester.

GPA Restart

If a student who has completed a master's degree at the NYU Tandon School of Engineering wishes to pursue another master's degree(s), the student's GPA is re-started. In this way, the academic performance for each degree is accurately represented. A GPA cannot be restarted at the beginning of or during the PhD degree program. Any GPA restart is noted on the student's transcript.

Academic Standing and Probation

Graduate students are expected to progress in their studies and maintain a minimum 3.0 cumulative GPA at all times. Failure to do so results in the student being placed on academic probation. Graduate students are permitted a maximum of 2 semesters of probation, and these semesters need not be sequential in order to count towards the maximum limit.

Student academic progress is evaluated at the end of the spring and fall semesters (and at the end of the summer for summer admits only), irrespective of Incomplete or temporary (S/U) grades, and irrespective of whether students have dropped or withdrawn from any course(s). Any student whose GPA drops below 3.0 will be placed on probation and notified by the Office of Graduate Academics.

Students on probation must submit a signed Graduate Acknowledgement of Academic Probation and Potential Disqualification form to the Office of Graduate Academics before the start of the next semester. Students who are not yet registered for the following term will not be permitted to do so until the form is submitted to the Office of Graduate Academics. Students already registered will be de-registered from their courses if they do not submit the form. Further, any student who is on a second (final) semester of probation must obtain permission from the Office of Graduate Academics if they wish to make registration changes. The registration hold and the probation form serve to remind students on probation that they are not meeting required academic standards. No indication of academic probation appears on a student's transcript, but a record is kept on file. Academic disqualification, however, is noted on the student's transcript.

Students on final probation must have a cumulative GPA of 3.0 or above at the end of that semester, or the student will be disqualified from the School. Disqualified students will not be considered for readmission. If a student is disqualified, any grade of Incomplete, S, or U at the time of disqualification will remain as such on the student's transcript.

In addition to the academic probation process described above, a major department may request that a graduate student be placed on academic probation at any time. The request and its justification are signed by the Department Chair and sent to the Office of Graduate Academics for approval.

The probationary policies outlined above may differ from the policies governing conditionally admitted students; please refer to the Graduate Admission section on Conditional Admit status for more information, or address specific questions to the Office of Graduate Academics.

Leaves of Absence and Readmission

Leave of Absence

A student who wishes to temporarily suspend graduate studies may request a Leave of Absence. If a Leave of Absence is being requested for medical reasons, please consult with the Office of Student Affairs. A request for a Leave of Absence for any reason other than medical must be approved by the Office of Graduate Academics. If the leave is approved, the student's matriculated status is maintained, and the student may resume his or her studies after the Leave of Absence. The Registrar will record a Leave of Absence on the student's transcript.

Leaves of Absence, if approved, are granted for a maximum of one year except in extreme cases, such as compulsory national service (if such service is for more than one year). International students must also receive approval for the leave from OGS, as an approved Leave of Absence is an academic decision and does not override OGS concerns. For students admitted prior to Spring 2019, the Leave of Absence does not extend the time limit for earning a degree. For students admitted as of Spring 2019, any approved Leave of Absence does not count against the maximum time to completion, and the time limit will be extended by the number of semesters granted for Leave of Absence. (See section on Maximum Time for Program Completion.) The approval of a Leave of Absence does not preclude subsequent academic disqualification.

In most circumstances, non-medical Leaves of Absence are only approved for students in good academic standing with NYU Tandon SOE.

Readmission

Students who do not maintain continuous registration and who are not on an approved Leave of Absence must apply to NYU for readmission if they wish to continue their graduate studies. Re-admitted students must pay accrued fees for the lapsed semester(s). If readmitted, their subsequent program attendance will be guided by the terms and conditions of the readmission and by the Bulletin and rules in effect at the time of readmission. Lapsed semesters do not extend the maximum time permitted to complete the degree. If students who re-apply cannot complete their studies within the allotted time permitted from the date of their initial admission to NYU Tandon School of Engineering, they can be re-admitted as a new student, but prior courses will be treated as part of the total transfer credits permitted (see section on Transfer Credits).

Leave of Absence and Readmission for Veterans

Students in graduate programs taking a Leave of Absence to perform military services are reinstated into the same degree program with the same academic status that they had when last in attendance at the institution. The length of absence from the institution cannot exceed five academic years unless the student requests and receives an exception from the Office of Graduate Academics. Such requests when approved by the Office of Graduate Academics constitute assurance of reinstatement to the degree program from which the leave was taken. If the period of absence exceeds the approved leave, students must apply for readmission.

Withdrawal from the University

Voluntary Withdrawal

Graduate students who wish to withdraw completely from NYU Tandon SOE (as opposed to a term withdrawal) must first withdraw from all courses in which they are currently registered, and then they must complete the online total withdrawal form. To receive W grades for the semester, the withdrawal must be completed by the withdrawal deadline indicated in the academic calendar. The mere absence from courses does not constitute official withdrawal, but results in F grades recorded for courses not completed. No complete withdrawal is official unless and until this form is completed and submitted to the NYU Tandon SOE Office of Records and Registration and approved by all required signatories. Students who submit an online total withdrawal request which is approved must reapply to NYU Tandon SOE should they wish to resume their studies in the future, and readmission is not guaranteed.

Involuntary Withdrawal

NYU Tandon School of Engineering is concerned about the health, safety and well-being of its students. Students judged to be a threat to themselves or to others may be withdrawn involuntarily from the School. The School seeks, whenever possible, for such students to be allowed to continue as active students if they agree to undergo professional care. Full details concerning this policy are available from the Office of Student Affairs.

Application Process for the Award of Master of Science and Doctor of Philosophy Degrees

Graduate students must file a formal application via Albert Student Center for the award of any NYU Tandon School of Engineering degree or certificate. Filing dates for each semester are published by the University Registrar. Students who do not file by the published deadline dates become candidates for the next conferral period.

Degrees are conferred and diplomas issued three times per year, typically in January, May, and September. All work for the degree must be completed and submitted before the graduation date.

NYU policy prohibits the awarding of a degree to members of the School teaching staff who hold a rank above the grade of Instructor.

Please note that a degree is not awarded unless the student applies for graduation, even if all requirements have been met. The date of the degree follows the application date for its award, not when all requirements are completed. If the application is filed more than two years after completion of degree requirements, the approval process is not automatic, and additional administrative actions may be required on a case-by-case basis.

Diplomas

Diplomas are mailed to the student about eight weeks after the degree conferral date. Diplomas are issued only once, subject to rare exceptions made on a case-by-case basis. Replacement diploma procedures and fees are published on the University Registrar's website. Replacement diplomas for the NYU Tandon School of Engineering will be printed with the school name at the time of the student's graduation.

Continuation of Studies Beyond the Initial Certificate or Master of Science

Students planning to pursue additional studies immediately following the award of an advanced degree by NYU Tandon School of Engineering should complete a new application for admission and submit it to the Graduate Admissions Office for review and approval by the department in which the new degree will be pursued. Examples are: 1) progressing from a certificate program to an MS program; 2) progressing from an MS program to a PhD program; 3) seeking a second MS degree from NYU School of Engineering. For rules governing the application of prior NYU School of Engineering credits towards a new degree program, please refer to the section on Transfer Credits and Transfer Policy Exceptions.

Internship Policies and Guidelines

Graduate internship courses are designated by CP-GY.

These courses provide an opportunity for full-time students to pursue internship and work experiences in their fields of study that enhance and augment classroom learning, while also enhancing the overall educational experience by obtaining practical experience.

Eligibility and Requirements: Students

F-1 international students are required to complete at least two semesters of full-time study in the United States (U.S.) to be eligible for internship authorization. This may include time spent studying at another U.S. institution, including completion of a bachelor's degree immediately prior to studying at NYU. Please contact the Office of Global Services for details on F-1 internship eligibility.

All graduate students must have a grade point average (GPA) of at least 3.0, as reflected on their academic transcript. Students cannot enroll in CP courses if they have an incomplete grade (I) in any course from a prior semester. Students cannot enroll in a subsequent CP course if they have an incomplete or a fail grade (F) from a previous CP course. Students cannot enroll in a CP course if they have received Maintenance of Study (MOS) and/or a Time Extension for their current degree program. As stated above in the Graduation Requirements section for Master of Science, MS students may use no more than 3 credits of internship toward fulfillment of MS degree requirements.

Eligibility and Requirements: Work Experiences

During the academic year, work experiences must be at least 12 weeks long. During the summer, they must be at least 8 weeks long. Additionally, the work experience must be a minimum of 240 hours. Start and end dates need not coincide with the first and last day of the semester, but must fit within the semester in order to ensure that final reports may be submitted and grades may be submitted in a timely manner.

During the academic year, students cannot work more than 20 hours per week while classes are in session. Students who are in their final semester of study and who require, and are registered for, no more than 3 non-internship credits plus 0.5 to 3 internship credits -- for a total of 3.5 to 6 credits for the term -- may be approved to work 40 hours per week. During the summer, students are permitted to work full-time, provided that they are not also taking more than 3 credits. Work hours must be consistent with the organization's regular work schedule.

Work experiences must comply with the Fair Labor Standards Act (www.dol.gov/whd/flsa). As such, students must be paid at least minimum wage unless specific exceptions apply. The Department of Labor outlines a six-point test (www.dol.gov/whd/regs/compliance/whdfs71.htm) regarding unpaid internships. Employers should consult their legal counsel for more information.

Students must be hired as employees of the participating organization and must be paid directly by the organization using a W-2 form. Employers cannot pay students as independent contractors using an IRS 1099 form.

Employers must agree to assign a responsible, ranking employee as the student's supervisor. This individual will provide appropriate supervision and mentoring, including establishing clear goals and expectations regarding tasks and projects. Employers must be willing to submit written midterm and final evaluations of the student's work. Experiences will not be approved for companies that are not permitted to submit written evaluations. Employer supervisors must review the student's final report so that proprietary and/or confidential information can be removed.

Procedures

Students must obtain an offer letter on organization letterhead from the prospective employer. This letter must identify the company, its address, contact information, the student's job title, and start and end dates of the internship.

Students must update their placement information through their NYU CareerNet account Profile, per instructions provided by the Wasserman Center for Career Development.

Prospective employers must complete the Employer Registration Form, which includes a detailed job description.

Students will submit their offer letter, Employer Registration Form, and printed NYU CareerNet Profile to their departmental adviser who will identify a suitable faculty adviser. The faculty adviser will be responsible for all academic matters related to the work experience. The faculty adviser will evaluate the relevancy of the work experience and, if approved, will direct the student to register for the appropriate CP course.

For approved International Students, the faculty adviser will provide the Office of Global Scholars (OGS) with all relevant information in order to process work authorization. International Students cannot begin working until they have received work authorization.

The company supervisor must provide a mid-term evaluation and a final evaluation to the faculty supervisor. The student will submit a project report at the end of the term. Some departments or programs may also require a presentation. The report (and presentation, if required) will be included as a part of the assessment for the student's grade. Faculty advisers will provide guidelines for the reports. All CP courses will be graded as Pass (P) or Fail (F).

With the faculty adviser's approval, consecutive work experiences may be completed with the same employer. Students must complete the same registration process and follow all procedures for re-applying and enrolling in another CP course. International Students must obtain prior permission from OGS for every period of employment. Students are not authorized to work during the interim period between the end of their prior CPT and the beginning of their next even if they will have an internship with the same company; this jeopardizes their visa status.

Anti-Reneging Policy

NYU Tandon does not permit graduate students to renege on internship offers, as it is unfair to companies, harms the school's reputation, and discourages companies from continuing to hire current and future students. Even when at-will laws apply, students may not renege on an internship offer once accepted. Students may turn down an offer if it is not to their satisfaction. However, once an offer has been accepted, students are expected to and required to honor their agreement with that company, even if they should later receive a better offer from a different company. Once an internship has been approved by a student's department for academic credit, no other internship will be approved for the same student in the same semester. Students must complete their internships; leaving an internship before the end date is prohibited.

Penalties for violating the anti-reneging policy include, but are not limited to: receiving an *F* for the internship course and not being permitted to do another internship. For international students, this means no further CPT will be approved.

Academic Success, Advising and Tutoring Services

First-Year Programs

The School is committed to improving the persistence and performance of first-year students by helping them to acclimate to their academic discipline, its associative culture and student life. The office is the primary contact for first-year student issues and offers diverse and dynamic collaborative efforts with constituencies across the campus community. These partnerships provide a great sense of cohesion to the programs and services that meet the needs of first-year students. Programs and services offered include first-year advisement, early alert and academic probation initiatives, first-year instructors meetings, and parent outreach. (See Section on "Programs and Services for the First-Year Students" for an expanded description of the programs and services in this area.)

Academic Advisement Center

The mission of the Academic Advisement Center (AAC) is to provide centralized advising for all incoming, matriculated first-year students, empowering them to make informed decisions about their academic careers. The staff advises students on major requirements and School regulations and refers them to campus resources. In addition, academic advisors advocate for students with NYU Tandon School of Engineering offices and help students deal with issues affecting them. Students are assigned advisors in their major departments after the first year.

Students may make an appointment or drop in to see their advisor. Advisement sessions cover an array of topics, including major requirements, School regulations and life-skills development. The center refers students to campus resources for additional support and guidance in an effort to address any School related issues affecting them. In addition, academic advisors advocate for first-year students with the offices of the Registrar, Financial Aid, Student Accounts and Admissions, as well as other offices.

In conjunction with the Office of Academic Affairs, the center assists with the review of first-year students' progress to determine academic standing. Students on probation are directed to meet regularly with their advisors to discuss their situation and learn how to make improvements to return to good academic standing. All first-year, first-time probationary students must enroll in and attend SL 1020, Academic Skills Seminar.

For more information about the center, visit http://engineering.nyu.edu/academics/support/academic.

Office of Academic Affairs

The office reviews all undergraduate students' progress each semester to determine academic standing. Decisions are made on eligibility for the Dean's List, academic probation, disqualification and appeals of academic disqualifications. Notifications for all academic actions are e-mailed to students and their academic departments and School support offices.

This office also coordinates evaluations of transfer credits in cooperation with the Office of Admissions and academic departments. The Office of Academic Affairs also serves as liaison between the Office of Undergraduate Academics and undergraduate advisors to ensure uniformity of advising practices. The staff also assists the Dean with articulation agreements with other universities.

TRIO Scholars Program

TRIO is a series of federal programs designed to create educational opportunities for disadvantaged students, aimed at their successful progression through, and completion of, their postsecondary career. In terms of its categorization on the TRIO spectrum, NYU Tandon School of Engineering's program is a Student Support Service Project, and is referred to as the TRIO Scholars Program. The mission of the program is to provide high quality, holistic support services to first-generation college students, modest-income students, and students with disabilities pursuing a baccalaureate degree at the NYU Tandon School of Engineering in order to help them reach their full academic potential, persist, and graduate from the University.

The services provided by the TRIO Scholars Program are broad, personalized and are adapted and adjusted to meet students' needs as they progress through the academic continuum. The services provided include:

ACADEMIC COACHING:

Each TRIO Scholar is assigned to a TRIO staff member whom they meet with on a monthly basis. Staff members work with students to: build on strengths; identify any potential barriers to success; determine a plan for development in identified areas for growth; develop healthy coping and problem-solving skills; and stay on track towards graduation.

INDIVIDUALIZED TUTORING:

TRIO Scholars receive individualized tutoring in the course(s) they request. Tutors are provided to students in chemistry, biology, math, physics, computer science, and other courses. These structured, weekly, hourlong sessions offer an opportunity for students to deepen their understanding of course material and have their specific questions answered. Small-group clinic hours and weekly review sessions, study aids, instructional software, and other academic resources are also available through the program.

ACADEMIC COUNSELING:

Academic counseling is available to help students manage the academic challenges of university life.The counseling component of the TRIO Scholars Program includes individual study skills advisement, financial aid counseling, major and career exploration, health and wellness counseling, and limited personal counseling. The counselor on staff assist students with mastering the technical curriculum at NYU Tandon School of Engineering, and any concerns which may be affecting students' academic and/or personal success.

SOCIAL INTEGRATION ACTIVITIES:

The program schedules cultural and educational workshops and trips throughout the academic year. All events are geared towards the academic and personal development of TRIO Scholars.

FINANCIAL ASSISTANCE:

The TRIO Scholars Program provides eligible TRIO Scholars with limited financial assistance through grants and scholarships.

For more information about the TRIO Scholars Program, visit http://engineering.nyu.edu/trioscholars.

Polytechnic Tutoring Center (PTC)

Mission: The Polytechnic Tutoring Center (PTC) is committed to offering superior tutorial service in multiple first and second year subject areas by staying current with the best tutoring methodologies and technologies. We are dedicated to hiring and training well-qualified undergraduate peer tutors as well as professional writing consultants. The Polytechnic Tutoring Center maintains a caring, supportive, and encouraging academic support service to the NYU Tandon School of Engineering community. We measure ourselves by how all NYU students are prepared to excel. The Polytechnic Tutoring Center continues to engage in partnerships across the School to develop other tutoring strategies, including but not limited to group tutoring, mid-term and final reviews, study skills workshops, and workshops on various aspects of effective written and oral communication.

Vision: The Polytechnic Tutoring Center is committed to the overall academic excellence of the NYU Tandon School of Engineering. The Polytechnic Tutoring Center enhances the academic experience of all students by partnering with committed faculty and well-trained peer and professional tutors to support students as they achieve academic success.

The Polytechnic Tutoring Center (PTC) offers a range of academic support services to all registered students. Tutoring is offered for the biology, chemistry, computer science and physics courses for first- and second-year students. Tutoring is provided on a drop-in basis as well as through exam-review sessions.

The PTC also includes the Writing Center, where students receive help with college-level writing, reading and speaking assignments and with English-language mastery. The Writing Center is open to NYU Tandon students at any level, from first-year undergraduates through doctoral candidates. Writing Center staff work with students individually and in small groups.

Tutors are carefully selected and trained. They include undergraduate peer tutors, graduate students and instructors. Tutors know their subjects well and understand where students may have difficulty. They are skilled at explaining material in a variety of ways for maximum comprehension. All students' questions are respected; no question is too basic to ask. The PTC also helps students improve their learning skills in order to become more successful in college and throughout their careers.

PTC services are free of charge. For more information about the center, visit engineering.nyu.edu/academics/support/polytechnic.

Registration

During registration, students meet with their academic adviser who provides them with advisement and approves their selection of courses. Students then register themselves online via Albert and pay tuition and fees to the Office of the Bursar via eBilling, all according to published deadlines. To receive academic credit, students are required to register each semester for every course they are taking, including thesis, projects and guided studies. Class attendance without registration is not permitted.

Advisement for Registration

The academic advising process is the basis for student course selection and registration. Each academic department identifies faculty or professionals who serve as advisers to the students. Before registration, students must meet with their adviser and receive approval for their anticipated program of study. Students may obtain a list of advisers and their contact information from their respective departmental offices.

To ensure that students have met with their academic advisers before registration, the Office of the Registrar places an "Advisor Clearance hold (XAC)" on the student's record. When students meet with their advisers, the hold is removed and students can register.

Approval to register for a course does not necessarily constitute approval to substitute that course for another course to satisfy a specific degree requirement. For example, approval to register for a guided readings course is not necessarily approval to substitute that course for another similar course prescribed in the curriculum. If the course is not normally used for that purpose, students should explicitly request such approval from the adviser.

Incoming first-year students may be required to take a mathematics diagnostic and/or English placement exam. These exams are free and used solely for advisement and course placement.

Registering for Classes

The NYU Tandon School of Engineering offers two registration periods for each semester (detailed below). New freshmen entering in the fall semester register during the summer preceding their arrival on campus. New first year students and special students receive registration information from the Office of Undergraduate Admissions or the Graduate Admissions Center.

Regular Registration

All continuing, degree-seeking students (graduate and undergraduate) are expected to register for the next semester during the latter part of each ongoing semester. All students must take advantage of regular registration via Albert, the student online registration system. All students are encouraged to enroll early in the registration period to avoid being closed out of required courses. Registration dates for each semester are published by the Office of the Registrar. Payment of tuition and fees, or arrangement for payment, is due to the Office of the Bursar no later than the published deadline.

Late Registration and Add/Drop

The Late Registration period begins during the second week of the term. A late fee is assessed to all continuing students who register during this Late Registration period. Payment of tuition and fees is due on the same day as registration during the Late Registration period. After the Add/Drop Deadline, students seeking to register need to obtain special permission from the respective Associate Dean in addition to the course instructor(s) and/or department(s). Such exceptions are rarely permitted, and must be submitted to the Office of Records and Registration with the appropriate paperwork and signature approvals.

Additions or deletions to a student course schedule may be made according to the deadlines published in the Registration Calendar. These adjustments should be made online through Albert. A course dropped after the third week of classes is considered a Withdrawal, and such courses will remain on the student's transcript with a grade of "W" (which has no GPA penalty).

If a student drops or withdraws from a course, tuition charges are adjusted according to the Refund/Tuition Liability schedule published by the Office of the Bursar.

Special Programs

- General Studies (GS) Program
- Opportunity Programs (OP)
- Honors Program
- Center for K-12 Stem Education

Student Services

Wasserman Center for Career Development | Brooklyn

The Wasserman Center for Career Development | Brooklyn will connect you with leading companies that are searching for highly skilled, market-ready individuals prepared to take on the challenges and opportunities of the 21st century. Our offices help undergraduate and graduate students seek positions where their refined technical, analytical and communication skills can best be put to use.

Career Counseling and Career Development Seminars

Knowing how to conduct an internship or job search is key to landing the opportunity you want. Through one-on-one career counseling and group seminars, NYU Tandon School of Engineering students acquire effective job search skills designed to complement their successful in-classroom experiences. Writing an effective resume, preparing for a career fair and acing the interview are just some of the topics addressed by career center staff.

Internship Opportunities

Internships allow students to gain real-world experience, while giving employers a chance to identify future talent. Students are encouraged to participate in one or more internships before they graduate, demonstrating to employers NYU Tandon School of Engineering's high standards of excellence. These professional experiences give students an edge over the competition and have the potential to turn into full-time opportunities following graduation.

NYU CareerNet, Career Fairs and On-Campus Recruiting

NYU Tandon School of Engineering students can connect to NYU CareerNet, our online internship and job search engine. Using this valuable database, students can submit a cover letter and resume directly to employers. Additionally, internship and job seekers can meet with hiring companies at career fairs and even arrange on-campus interviews with these employers. Participating companies range from small entrepreneurial start-ups to mid-sized businesses to internationally recognized major corporations.

Tandon Career Services

NYU Tandon offers additional career services that are tailored and customized to meet the specific needs of STEM students. Coaching and professional development training is delivered by a team of experienced industry professionals: our office engages with employers from a variety of industries to create meaningful job and internship opportunities for our students.

For more information about Tandon Career Services, visit https://engineering.nyu.edu/student-life/tandon-career-services.

Counseling and Wellness Services

"*Helping Students Achieve Maximum Potential*"

Counseling and Wellness Services offers free, confidential psychological services to all NYU Tandon School of Engineering students. College can be a stressful time, and students can face a range of difficulties that can interfere with their ability to succeed academically or function at their best. For example, many students struggle with concentration, test anxiety, sadness, lack of motivation and difficulties with family or friends that can interfere with their NYU Tandon School of Engineering experience. The Counseling and Wellness Services staff is available to meet with students and help resolve these issues. Staff members provide information and support to help students solve problems, achieve goals and feel better.

Students can make an appointment by calling (646) 997-3456 or stopping by the center in Rogers Hall.

Counseling and Wellness Services is open Monday through Friday, 9 a.m. to 5 p.m. Additionally, the NYU Wellness Exchange operates a 24-hour hotline at 212-443-9999.

Throughout the year, Counseling and Wellness Services offers workshops on meditation, stress reduction, relationships and getting a good night's sleep. Workshops are advertised on the Counseling and Wellness Services website, in the NYU Tandon School of Engineering calendar, and through campus e-mail blasts.

For more information about Counseling and Wellness Services and its services, visit our website.

Updated information on participation in NYU sponsored activities and services is available on the website.

Services for Students with Disabilities [Moses Center]

NYU Tandon School of Engineering is committed to providing equal educational opportunity and participation for students with disabilities. It is the University's policy that no qualified student with a disability be excluded from participating in any University program or activity, denied the benefits of any University program or activity, or otherwise subjected to discrimination with regard to any University program or activity.

The mission of the Moses Center for Students with Disabilities (CSD) is to facilitate equal access to programs and services for students with disabilities throughout the schools and divisions of New York University (NYU) and to foster independent decision making skills necessary for personal and academic success. Accommodations for students with disabilities do not include the waiving of academic course requirements.

Students with disabilities are encouraged to register with the Moses Center for Students with Disabilities (CSD) whether or not services are requested. Students can request services by meeting with a Disability Specialist and submitting supporting documentation. Visit the NYU Moses Center website for more details.

International Students and Scholars

Graduate and undergraduate international students come from more than 60 countries, make up 40 percent of the student body and are an integral part of the NYU Tandon School of Engineering community. All new international students and visiting scholars (researchers and faculty) are required to report with immigration documents, including I-20s, DS-2019s and passports, to the Office of Global Services (OGS) immediately upon arrival. In addition, all new students and scholars must attend a mandatory orientation held at the start of every semester.

The office provides information and counseling regarding immigration compliance, travel, employment, acculturation, housing, health insurance and special events. International students, researchers and faculty may contact the office in person, by email, or by telephone, and are encouraged to attend on-site workshops offered at designated times during the academic year. All international students, research scholars and faculty are required to carry health insurance.

For additional information on admissions and academic requirements, please consult those sections dealing with undergraduate and graduate admissions and academic programs and policies.

Study Abroad

The opportunity to study abroad provides students a chance to experience life in countries rich in history, culture and accomplishment. Immersion experience in another culture strengthens understanding of the world and appreciation of international contribution to knowledge. It offers an opportunity to learn how to cope in international environment and communicate across barriers of language, custom, geography and politics. Skills developed during this experience add an invaluable dimension to the quality of a well-rounded education that ultimately enhances professional and personal endeavors in the developing global community.

Students may apply for short-term study, a semester, or a full academic year abroad. Students may select from one of 50 institutions around the world with which NYU Tandon has direct-exchange agreements, as well as NYU Study Away sites.

Participation in the study-abroad program is open to undergraduate and graduate students. Undergraduate students are eligible after one year of academic study so long as they maintain a 3.0 GPA. While these are the minimum NYU Tandon School of Engineering requirements to participate in the program, host institutions will make their own determinations about admissibility.

Academic credits earned during study abroad are transferable to NYU Tandon and may be applied to degree requirements subject to school policies and the approval of the student's major department. For additional information contact the Office of Undergraduate Academics.

Programs and Services for the First-Year Students

First-Year Programs

The School is committed to improving the persistence and performance of first-year students by helping them to acclimate to their intended academic discipline, its associative culture and student life at the NYU Tandon School of Engineering. Achieving this goal requires diverse and dynamic collaborative efforts with constituencies across the campus community. These systemic partnerships yield a greater sense of cohesion to the programs and services for first-year students.

Programs and services in this area include first-year advisement, early alert and academic probation initiatives, first-year instructors meetings, and parent outreach.

Academic Advisement Center

The mission of the Academic Advisement Center (AAC) is to provide centralized advising for incoming, matriculated first-year students. The staff advises students on major requirements and School regulations and refers them to campus resources. In addition, academic advisers advocate for students with NYU Tandon School of Engineering offices and help students deal with issues. The ultimate goal of the AAC is to empower students to make informed decisions about their academic careers.

Early Alert and Academic Probation

Each semester requests are sent to first-year instructors asking for feedback on their students' academic progress. Students at risk of not passing their course(s), based on their current progress, are notified of their academic status and encouraged to meet with their instructor(s) and academic adviser to remedy the situation. At these meetings, students have the opportunity to think critically about the behaviors contributing to their status, while being invited to take advantage of the various support services to help them maximize their academic experiences.

All first-year, first-time probationary students must register for and pass SL 1020 Academic Skills Seminar. The course consists of eight one-hour sessions, which meet once a week, and is taught on a pass/fail basis. The seminar helps students learn to become more academically successful. The "Academic Probation" section of the catalog contains more information about this course.

Parent Outreach

Educating parents on the academic experiences of first-year students is a critical step in forming an effective partnership between the School and family members. Participating in University-wide parent gatherings, along with the individual meetings that happen over the course of the academic year, provide family members with an opportunity to speak directly with faculty, administrators and students about the majors and support services available to students.

New Student Orientation

(See Section on "New Student Orientation" under Student Affairs: Activities, Advocacy, Leadership.)

First-Year Dialogue Program

(See Section on "New Student Programs" under Student Affairs: Activities, Advocacy, Leadership.)

Residence Life & Housing Services

The Office of Residential Life and Housing Services exists to provide quality service and enhance student success in a safe and diverse living/learning community that fosters individual growth.

Our residence halls are an extension of the classroom; we seek to provide experiences that will help our residents develop into global citizen. We are committed to providing our students with an inclusive, healthy and welcoming home.

Campus housing is available for all students. NYU Tandon School of Engineering does not provide housing for students' families. Inquiries about campus housing should be made to the Office of Residence Life and Housing Services at (212) 998-4600.

Campus Housing Facility

On the Brooklyn campus, the Donald F. and Mildred Topp Othmer Residence Hall is a 20-story building that houses more than 400 students in two-bedroom suites and two-bedroom apartments with kitchenettes. Each room has Internet and cable TV ports. This innovative building is wireless and includes student lounges, study rooms, laundry facilities, outdoor space and 24-hour security. Two full-time professional residence-life staff members work with graduate and undergraduate student resident assistants and security personnel.

The Clark Residence is connected to the St. George Residence - Weller Building and Studio Building - and occupies the site of the former St. George Hotel in one of New York City's most desirable neighborhoods, Brooklyn Heights.

Just one subway stop from lower Manhattan, the Clark Residence is within walking distance to NYU Tandon School of Engineering's MetroTech campus, shopping, dining on Montague Street and a short walk to the Brooklyn Promenade, home to breathtaking views of the Manhattan skyline.

Each single, double and triple fully-furnished room in the Clark Residence offers a TV, DVD player, high-speed internet, refrigerator, microwave and bathroom. The residence features lounges, a pool table, public computers, communal kitchens and a complimentary membership to the four-star Eastern Athletic Club.

Campus Housing Requirements

All students living on-campus are required to be full-time NYU Tandon School of Engineering students and Othmer residents are required to be on the School meal plan. For security purposes, all resident students are mandated to have a cell phone and sign-up for the Emergency Text Alert system (E2campus).

Student Affairs: Activities, Advocacy, Leadership

The Office of Student Affairs supports the NYU Tandon School of Engineering's academic mission by enhancing students' education through a range of programs that build intrapersonal, professional, emotional, and other essential life skills. We work in partnership with academic, support, and service departments to tailor our activities to students' needs. Our programs work to address emerging issues, develop student leadership excellence, promote and foster campus community citizenship, foster campus-wide diversity awareness, and provide general student advocacy. Additionally, the Office of Student Affairs partners with external stakeholders from corporations, not-for-profits, startups, and educational institutions to programmatically enhance the professional development of students and to fulfill diversity pipeline objectives.

Inclusion, Diversity, Belonging and Equity Initiatives

The Office of Student Affairs at Tandon is committed to supporting the diversity mission of New York University "to embrace diversity among faculty, staff and students to ensure a wide range of perspectives." NYU Tandon students reflect the diversity of the world and we have a responsibility to provide and sustain a safe and affirming environment. Our office seeks to create spaces that promote social justice through open and considerate dialogue and where differences are embraced, valued and celebrated. To that end, students will find a variety of opportunities to participate in activities, programs and trainings that allow them to live, learn and grow as global citizens that contribute to the development of a better world. Our Student Affairs hallmark events, the Diversity in STEM and Women in STEM Summits, each happen once an academic year and provide a hands-on day-long experience for students to engage with these issues through workshops, panels, and keynote events.

Please find more information about the University's commitment to diversity here: https://engineering.nyu.edu/campus-and-community/student-life/diversity-initiatives

New Student Programs

The NYU Tandon School of Engineering seeks to ease the transition for students into their new environment with a variety of programs designed to orient and welcome new students. These programs are generally held before the fall and spring semesters.

First-Year Dialogue Program

The first-year dialogue is a summer reading program that was launched in 2011. It was inspired by the educational paradigm, i^2e, that brings innovation, invention, and entrepreneurship to the NYU Tandon School of Engineering and the academic experience. Over the years, as Tandon has transformed into a hub for Technology in Service to Society, and launched its premier MakerSpace, the first-year dialogue has aligned with these important School priorities. Since 2019, Tandon has partnered with NYU Reads, which provides a common selected text for all first-year students at NYU before their semester of entry. This reading program extends beyond Welcome Week and throughout the semester as first-year students have the opportunity to participate in book discussions and engage in programmatic events related to the selected book and theme.

New Student Convocation

New Student Convocation, occurring during new student orientation, is the first major academic program new students experience as members of the NYU Tandon School of Engineering community. At convocation, new students are inducted into the School's academic community and are introduced to a variety of speakers and university administrators. The convocation is the official kick-off of the week-long orientation for all new students.

New Student Orientation (NSO)

Orientation is designed by various offices throughout the School and with the help of student Orientation Leaders to welcome all new students to the Tandon community and introduce them to the various campus offices, programs, and resources that lead to student success.

New Student Orientation introduces new students to the School of Engineering community and offers opportunities for incoming first-year and transfer students to complete their enrollment activities well before classes begin. Students will receive the information and tools needed to successfully acclimate to NYU Tandon, and become an active member of the academic community. Orientation programs are designed around the objectives of familiarizing students with their intended major, increasing understanding of the first-year curriculum and its connection to the academic discipline, and familiarizing new students with critical on-campus first-year support networks.

The overall goal is to create a sense of excitement and enthusiasm around the students' majors, while demystifying preconceived notions about majors and college life. The program is coordinated by a team of administrators, faculty, and students who welcome new students to the Tandon community.

Office of Student Activities and Resource Center

The Office of Student Activities and Resource Center (OSARC) exists to support the academic goals of the NYU Tandon School of Engineering by providing services and programs designed to enhance and maximize students' co-curricular educational opportunities. All programs and services are designed and implemented with the aim of creating a rich educational environment, infused with the core values of community engagement & civic responsibility, diversity & cultural competency, innovation & creative thinking, interpersonal & leadership development, and connection to the global network university.

Community Engagement

- Student Organizations: With over 40 student organizations ranging from professional and cultural groups to performing arts and religious and spiritual groups, there is something for everyone. Check out Club Fest at the beginning of each semester where Tandon's clubs and organizations showcase their missions and programs while recruiting new members at the beginning of each semester. Find out more about clubs and organizations on NYU Engage.

- Mentorship Programs: Mentors are a specially selected group of students who provide guidance and support to mentees, while promoting and building community at the Tandon School of Engineering. Currently, formal mentorship programs exist for all women-identified students. Applications are accepted for mentorship programs in the Fall semester.
- Events and Programs: Join us for a wide range of campus-wide programs, including SOExcited You're Back, Empower Hour, Finals Study Break, International Student programming, off-campus trips, and discounted tickets or visit The HUB (LC 223), the central student lounge, to check out upcoming programs. Make sure to check out our annual programs that celebrate the wonderful traditions here at Tandon.
    - Tandon Kickoff - September
    - Diversity in STEM Summit - November
    - MLK Week - February
    - Tandon Spirit Week - February
    - Women in STEM Summit - March
    - Solidarity Week - April
    - Student Appreciation Day - May

Leadership Opportunities

- Student Council: Tandon's Student Councils are elected by students to serve as their primary representatives, advocates, and liaisons to the NYU community. Student Council members survey the student body, support student clubs and organizations, coordinate major campus events, and collaborate with offices and students across campus. Student Council elections take place each Spring for both Graduate and Undergraduate Councils.
- Orientation Leaders: OLs provide incoming students and their families with a personal introduction and connection to NYU Tandon. They highlight school spirit and tradition, academic expectations and campus life, and promote resources available for student success. OLs are selected in the Spring for both Graduate and Undergraduate Orientation and the Fall for Graduate Orientation only.
- Tandon Leadership Lab: Tandon Leadership Lab is a series of workshops that guide students - through hands-on activities and critical dialogue - in discovering who they are as leaders and becoming confident with tangible leadership skills and strategies that can be applied to their everyday lives.

Service Opportunities

- The Poly Project: Tandon's service-learning initiative works to provide regular and sustained opportunities for students to engage in community service. Students are able to volunteer in the local Brooklyn community and serve in leadership roles as Service Ambassadors.
- SOEciety: The SOEciety Service Learning Experience provides students with an immersive alternative break volunteer experience that allows them to better understand personal and social identities, while working to serve a community's needs as future leaders in STEM. Through this experience, students will engage with topics of social justice and leadership while working toward becoming social change agents.

Advocacy & Compliance [Office of Student Affairs]

Student Advocacy

The Office of Student Affairs plays a vital role in supporting and encouraging students who are faced with challenging situations during their student careers. It is one of several places where students can get confidential help. As a student advocate, Deanna Rayment, Coordinator of Advocacy, Compliance, and Student Affairs, works with various other offices to help students solve problems and develop self-advocacy skills.

Excused Absence and Required Notification to Faculty

Students may request special accommodations for class absence in the following cases:

- **Medical reasons**
- **Death in immediate family**
- **Personal qualified emergencies (documentation must be provided)**
- **Religious Expression or Practice**

If illness or an accident causes you to miss a class (or classes) or an exam, you should do the following:

- **Notify Deanna Rayment in the Office of Student Affairs via email (deanna.rayment@nyu.edu) of your absence within two weeks of the absence.** This email should contain appropriate documentation as to why you were absent. All correspondence should contain your N#.

Any medical documentation should include:

- **Diagnosis**
- **Exact dates of absence**
- **Estimated of the length of your absence**
- **Return Date**

***If medical documentation does not list the above, your request for excused absence will be considered incomplete, which may delay processing the request. ***

Do not provide anyone except this office with a copy of your medical documentation; the Office of Student Affairs is the office designated to receive documentation regarding private concerns. If a professor requests a copy, refer them to Student Affairs. This is to protect the confidentiality of your medical information.

Please Note: Absence based on personal travel is not excused. In the case of final exams, failure to attend and take the exam may result in a failing grade.

Student Religious Observance

View NYU's policy regarding observing religious holidays here: https://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/university-calendar-policy-on-religious-holidays.html

The School of Engineering's policy requires students to provide Deanna Rayment in the Office of Student Affairs with written notification via email (deanna.rayment@nyu.edu) at least 15 days in advance of the days to be taken off, as well as the course names and course numbers of missed classes, name and email contact for your professors. Student Affairs will provide notice to your professors. Students remain responsible for work missed.

Conduct Compliance

Issues involving behavioral misconduct are referred to the Office of Student Conduct, Please check the Student Community Standards at https://www.nyu.edu/students/student-information-and-resources/student-community-standards.html

Issues of academic misconduct are handled initially by individual departments on campus. Please check the student Code of Conduct at: http://engineering.nyu.edu/life/student-affairs/code-of-conduct.

Index of HEGIS Codes

Degrees Offered at NYU Tandon School of Engineering

NYU Tandon School of Engineering offers a wide range of degree programs leading to the degrees Bachelor of Science, Master of Science, Master of Engineering and Doctor of Philosophy. The table below indicates the degrees registered at each campus. Please check with each department to confirm that a program is currently available at the locations indicated below. Graduate courses taken at any campus are applicable toward MS and PhD degree programs officially offered at another campus.

Program Title	HEGIS Code[1]	CIP Code[2]	Brooklyn	Manhattan	On-Line
Applied Physics	1902.00	14.1201	BS, MS, PhD		
Bioinformatics[3]	1999.20	26.1103			MS
Biomedical Engineering	0905.00	14.0501	MS, PhD		
Biomolecular Science	0499.00	26.0210	BS		
Biotechnology	0499.00	26.1201	MS		
Biotechnology and Entrepreneurship	0499.00	26.1201	MS		
Business and Technology Management	0599.00	15.1501	BS		
Chemical and Biomolecular Engineering	0906.00	14.0701	BS		
Chemical Engineering[3]	0906.00	14.0799	MS, PhD		
Chemistry	1905.00	40.0501	MS		
Civil Engineering	0908.00	14.0801	BS, MS, PhD		
Computer Engineering	0909.00	14.0901	BS,MS		MS
Computer Science	0701.00	11.0701	BS, MS, PhD		
Construction Management	0599.00	14.3301	BS, MS		
Cyber Security	0701.00	11.1003	MS		MS
Electrical Engineering[3]	0909.00	14.1001	BS,MS, PhD		MS
Electrical and Computer Engineering (dual major)	0909.00	14.1001	BS		

Environmental Engineering	0922.00	14.1401	MS		
Environmental Science	0922.00	14.1401	MS		
Financial Engineering	0599.00	27.0301	MS	MS	
Industrial Engineering[3]	0913.00	54.0401	MS		MS
Integrated Digital Media	0604.00	11.0103	BS, MS		
Management	0506.00	15.1501	MS		
Management of Technology	0599.00	15.1501	MS	MS	MS
Materials Chemistry	1905.00	14.1801	PhD		
Mathematics	1701.00	27.0301	BS, MS, PhD		
Mechanical Engineering	0910.00	14.1901	BS, MS, PhD		
Mechatronics and Robotics	4904.00		MS		
Science and Technology Studies	2299.00	54.0104	BS		
Sustainable Urban Environments	4903.00	30.3301	BS		
Systems Engineering	0909.00	14.2701	MS		
Technology Management	0599.00	15.1501	PhD		
Transportation Management	0510.00	14.0804	MS		
Transportation Planning and Engineering	0908.00	14.0804	MS, PhD		
Urban Infrastructure Systems	0999.00	14.0803	MS		

[1] Higher Education General Inventory System

[2] Classification of Instructional Program

[3] Executive format program

Advanced Certificates Offered at the NYU Tandon School of Engineering

Program Title	**HEGIS code[1]**	**CIP Code[2]**	**Academic Department**	**Campus**

Bioinformatics	1999.20	26.1113		Online
Construction Management	0599.00	14.3301	Civil Engineering/Management	Brooklyn
Executive Construction Management (Exec 21)	0599.00	14.3301	Civil Engineering	Brooklyn
Traffic Engineering	0908.00	14.0804	Civil and Urban Engineering	Brooklyn
Transportation Management	0908.00	14.0804	Civil and Urban Engineering	Brooklyn
Transportation Planning	0908.00	14.0804	Civil and Urban Engineering	Brooklyn

Previous & PDF Bulletins

eBulletin archives are available in PDF below:

Please Note: These PDFs are provided for download and use when off-line. It is recommended that eBulletins be accessed from the drop-down menu on the top right of this page to be viewed in the intended web-format.

2011-2013 eCatalog PDF Archive (with addenda)

2011-2013 eCatalog PDF Archive (without addenda)

Previous academic bulletins are available in PDF format below:

2018-2020 Tandon School of Engineering Bulletin

2016-2018 Tandon School of Engineering Bulletin

2014-2016 Polytechnic School of Engineering Bulletin

2013-2014 Polytechnic Institute of New York University Catalog

2013-2014 Polytechnic Institute of New York University Catalog with Mech E Changes

2011-2013 Polytechnic Institute of New York University Catalog

2009-2011 Polytechnic Institute of New York University Catalog & 2009-2011 Catalog Supplement (PDF)

2007-2009 Polytechnic University Catalog

2005-2007 Polytechnic University Catalog

2003-2005 Polytechnic University Catalog

2001-2003 Polytechnic University Catalog

1999-2001 Polytechnic University Catalog

1993-1995 Polytechnic University Catalog

1992-1994 Polytechnic University Catalog

1988-1990 Polytechnic University Catalog

1986-1988 Polytechnic University Catalog

1983-1985 Polytechnic Institute of New York Catalog

1981-1983 Polytechnic Institute of New York Catalog

Center for K-12 Stem Education

The New York University Tandon School of Engineering has long recognized the critical need to engage K-12 students, teachers, schools and school systems through hands-on learning in science, technology, engineering, and math (STEM). These efforts aim to increase access to high quality learning experiences, STEM-focused higher education and related careers. For nearly 20 years - with funding from the National Science Foundation, and other public, philanthropic and corporate sources - the School's faculty, students and the Center for K12 STEM Education have developed innovative programs that bring STEM disciplines and concepts to every level of the K-12 education system.

The Center and its programs place strong emphasis on serving those who have limited access to high-quality STEM education and those students from demographic groups that are underrepresented in STEM fields: students of color, girls and young women, and those from low-income backgrounds. Our work with teachers largely focuses on educators serving these demographic groups.

Our methodology for K-12 STEM education and related research focuses on utilizing the expertise and passion of trained graduate and undergraduate students employed and supervised by the Center to develop and teach hands-on, activity based STEM curricula to younger students and their teachers, under the guidance of faculty members. We strongly emphasize authentic experiences: grounding curriculum and instruction in the application and integration of STEM concepts in the real-world and a social context; connecting content to ongoing research in our applied engineering, computer science and other labs; employing pedagogy that is inquiry based, problem solving and iterative; and deploying the actual tools of scientists and engineers: from microcontrollers, electronic components, actuators, and the like to high-end testing and experimental equipment used in research.

These activities, and our STEM education research projects, take place within programmatic and structured frameworks, provided by the Center for K12 STEM Education. These initiatives are sustained, deep engagements and support learning in classrooms, after-school environments and in on- and off-campus summer programs. The Center's programs engage and mobilize the School of Engineering's many communities including faculty, administrators and students, its physical resources of laboratories and classrooms and School initiatives that expose young people and teachers to the creative, exciting and academically challenging world of science.

K-12 students and teachers that participate in the Center's programs gain analytical skills and knowledge by engaging in scientific inquiry, an excitement about the personal possibilities educational attainment provides and a deep appreciation for the inherent inventiveness embedded in all kinds of scientific and academic pursuits. Achieving these goals puts students on the path to school completion, higher education and economic and social advancement. School of Engineering students that participate acquire leadership and presentation skills, contribute to solving the pressing local and national problems of a lack of diversity and equity in STEM studies and pursuits, and enhance and reinforce their own learning, creativity and professionalism.

Opportunity Programs (OP)

Through the NYU Opportunity Programs, two college programs are available to residents of New York State. The Arthur O. Eve Higher Education Opportunity Program (HEOP) is funded by the New York State Education Department to provide a broad array of academic and financial aid support to capable students who, due to limited educational and economic resources, might otherwise not have the opportunity to attend NYU. Once admitted to NYU through HEOP, students are eligible to receive a full-need financial aid package along with academic support in the form of counseling, tutoring, advisement, and other assistance throughout their undergraduate studies.

The Collegiate Science and Technology Program (CSTEP) is also funded by New York State to provide underrepresented or disadvantaged students access to academic programs that prepare them for careers in science, engineering, or health-related professions. Once admitted to NYU through CSTEP, students receive academic assistance including counseling, tutoring, advisement, and other support services throughout their undergraduate studies.

HEOP and CSTEP's goal at the NYU Tandon School of Engineering are to retain and graduate students who are traditionally underrepresented in science, technology, engineering, and mathematics fields.

For more information about HEOP and CSTEP, please visit the NYU Opportunity Programs page: https://www.nyu.edu/admissions/undergraduate-admissions/how-to-apply/all-freshmen-applicants/opportunity-programs.html

Honors Program

The NYU Tandon School of Engineering's Honors Program offers students of exceptional promise an enriched educational experience that extends beyond the traditional classroom environment. Learning takes place in a collaborative manner, where students are encouraged to critically reflect on their coursework by dialoging with various constituencies at the school. The program offers a superior educational experience by fostering critical thinking and creativity. Its depth and breadth are comprehensive and individualized.

Rigorous intellectual development through active learning and faculty mentoring combine with an interdisciplinary focus and global awareness prepares students to become leaders in engineering, science, technology and entrepreneurship. As rising scholars, Honors students are a highly enthusiastic and prominent part of the University's alumni population and enhance the overall reputation of the University for delivering excellence in education.

Admission and Application Procedures

The Honors Program has a referral-only admissions process. Selected individuals who are admitted to NYU Tandon as first-year students will be referred to the Honors Program Admissions Committee. Preference is given to students with outstanding high school GPA and SAT scores; however, files are reviewed in a comprehensive manner and other important criteria are given serious consideration.

Students who were not referred to the Honors Program during their initial application to Tandon are not eligible for the Honors Program; there is no transferring into the program. Additionally, transfer students are not eligible for the Honors Program.

Requirements

Students admitted to the Honors Program are required to satisfy the following requirements to remain in the program:

1. Maintain a minimum required cumulative Grade Point Average (GPA) each academic year:
    - *Freshman - 3.5*
    - *Sophomore - 3.5*
    - *Junior - 3.4*
    - *Senior - 3.4*
2. Earn a specified amount of credits by the end of each academic year:
    - *Freshman - 32*
    - *Sophomore - 64*
    - *Junior - 96*
    - *Senior - 128*

At the end of each semester, the Honors Program will review each student's academic record. If the student's cumulative GPA and/or credit amount is below the minimum requirement, as outlined above, the student is placed on a one-semester probation to improve his or her academic standing. If the student's cumulative GPA and/or credit amount is still below minimum requirements after the one-semester probationary period, the student may be dismissed from the Honors Program.

To graduate with the "Graduate of the Honors Program" designation, students must fulfill the BS requirements of the Honors Program. Students must submit a bound BS thesis to the Office of Undergraduate Academics, no later than two weeks before graduation, formatted as outlined in the document entitled: "Regulations on Format, Duplication & Publication of Reports, Theses & Dissertations," available in the Office of Undergraduate Academics.

Routes to NYU School of Engineering

- Brooklyn Campus
- Long Island Graduate Center (continuing students only)

Brooklyn

By Subway from all Boroughs:

A, C or F train to Jay Street-Borough Hall; or the 1, 2, 4 or 5 subway to Borough Hall (walk to Fulton Street and make a left onto Jay Street); or the R or M to Lawrence Street.

By Car from Manhattan:

Take the FDR Drive to the Brooklyn Bridge. Make the first left after the bridge onto Tillary Street and a right onto Jay Street.

By Car from Queens or the Bronx:

Take the Brooklyn-Queens Expressway to Tillary Street and then left onto Jay Street.

By Car from Staten Island:

Take the Verrazano Narrows Bridge to the Brooklyn-Queens Expressway to the Tillary Street exit. Make a left onto Jay Street.

By Car from New Jersey:

From the George Washington Bridge, take the Harlem River Drive to the FDR Drive or Holland Tunnel to Brooklyn Bridge. (Continue as from Manhattan)

By Train from Brooklyn or Long Island:

Take the Long Island Rail Road to Atlantic Avenue (last stop in Brooklyn). Then take a taxi or Bus #B67 to MetroTech on Jay Street, or the R or M subway to Lawrence Street. It's about a one-mile walk from the LIRR station: go to the Fulton Mall and make a left, then a right onto Jay Street.

By Car from Brooklyn or Long Island:

Take the Brooklyn-Queens Expressway to the Tillary Street exit. Go left onto Jay Street.

By Car from Westchester:

Take the Major Deegan or Cross Bronx Expwy. to FDR Drive to Brooklyn Bridge or the Triborough, Whitestone or Throgs Neck Bridge to Brooklyn-Queens Expwy. to Tillary St. From there take a left onto Jay St.

PUBLIC PARKING is available at the Marriott Hotel

Long Island Graduate Center (continuing students only)

From New York City & Long Island:

Take the Long Island Expressway (I-495) East to exit 49S (Rt. 110 S/Amityville). Merge onto the S. Service Rd. and turn right onto NY-110 S. (approximately half a mile). Turn left onto Baylis Rd. (approximately half a mile). Turn left onto Maxess Rd. (The Long Island Graduate Center is on the right within 150 yards. Enter through North entrance of 105 Maxess Road).

From Westchester:

Take the Hutchison River Parkway South to the I-95 S/Stillwell Ave exit. Keep right at the fork in the ramp. Merge onto New England Thruway. New England Thruway becomes Bruckner Expressway. Take the I-695 Exit 7A (on the left) toward I-295/Throgs Neck Bridge/Long Island. Merge onto Throgs Neck Expressway. Take I-695 S. I-695 S becomes Throgs Neck Expressway. Throgs Neck Expressway becomes I-295 S. Take the Cross Island Parkway exit toward Eastern Long Island. Merge onto Cross Island Parkway S. Take I-495/Long Island Expressway exit 30 toward Eastern Long Island. Merge onto Long Island Expressway. Take Exit 49S toward NY Route 110 S/Amityville. Merge onto South Service Road and cross over New York Route 110. Drive approximately one-half mile to Maxess Road and turn right. The Long Island Graduate Center is at 105 Maxess Road, Suite 201N, inside the Melville Corporate Center. Enter through the north entrance at the rear of the building.

General Studies (GS) Program

About

The General Studies (GS) Program provides proactive support for students, allowing them an opportunity to matriculate and successfully obtain a science, engineering, humanities, and management based education. To encourage student success, the GS Program provides a broad variety of services that begin with a mandatory summer intensive before the start of the first year and continue throughout the academic year with mandatory weekly tutoring and advisement sessions. Once admitted, students must participate successfully in the program for one year. Advanced Placement (AP) and transfer credits may not be used toward the completion of GS Program requirements.

For further information, visit the GS website (https://engineering.nyu.edu/academics/support-services/undergraduate-services/general-studies-program) or call (646) 997-3882.

Admission and Application Procedures

Admission to the General Studies Program is by invitation only. Selected first-year applicants to the NYU School of Engineering are invited to submit an application and may be interviewed by an admissions counselor to determine if their goals correspond with program objectives and services.

Academic Support Services

GS students have an array of services to help them adjust to the rigorous Tandon curriculum. Services include, but are not limited to, the following:

- A six-week on-site or online summer intensive before the start of their first year.
  - On-site students take a computer skills for engineering class and pre-college math, physics, and writing courses. Otherwise, students take an online math course. NYU Admissions decides whether the student's summer experience will be on-site or online; regardless of format, student participation in one or the other is required for admission to the NYU School of Engineering in the fall.
- College survival skills course.
- Small group tutoring and exam review sessions.
- Individual and group advisement sessions.

Advisement

At monthly group advisement meetings, students discuss questions and concerns about the academic curriculum and general college adjustment issues. Weekly individual advisement sessions are a more personal continuation of the group meetings, where students meet with a General Studies staff member to discuss a broad range of topics including academic, financial, and personal concerns as they relate to the students academic performance.

Financial Aid

General Studies students' financial-aid packages are based on the information entered on the Free Application for Federal Student Aid (FAFSA) and the CSS Profile forms. Students are urged to complete these forms as early as possible to get the best financial aid package. For more information about financial aid eligibility and the application process, please visit the NYU Financial Aid website.