

THE COOPER UNION

FOR THE ADVANCEMENT OF SCIENCE AND ART



COURSE CATALOG 2025–26

VOLUME 131 | SEPTEMBER 1, 2026 | IN EFFECT UNTIL REPLACED

[COOPER.EDU](https://cooper.edu)

THE IRWIN S. CHANIN SCHOOL OF ARCHITECTURE

DEGREE REQUIREMENTS

Master of Science in Architecture

All applicants to the Master of Science in Architecture program must 1) hold the professional degree of Bachelor of Architecture (B.Arch.), the professional degree of Master of Architecture (M.Arch. I) or an equivalent accredited professional degree in architecture from a foreign institution; and 2) have completed a minimum of one year of work experience after obtaining their first professional architectural degree. The program is structured to be completed in two full-time consecutive semesters with a final thesis semester during the subsequent summer session. See the Academic Calendar for information on the Fall and Spring semesters. The Summer semester runs from June-early September (after Memorial Day until the date of the Master of Science in Architecture final Thesis review and exhibition opening during the second week of September). Final thesis presentations will take place during the second week of September at the end of the student's year of study. Graduate students must complete all 30 credits of the Master of Science in Architecture degree requirements in full-time contiguous resident study at The Cooper Union

FOR STUDENTS ENTERING FALL 2026

Semester 1 (Fall)		
ARCH 411	Graduate Research Design Studio I	6
ARCH 401	Proseminar	2
FA100R	Introduction to Techniques	0
	Seminar in concentration	2
	Seminar of choice	2
Total Credits First Semester		12

Semester 2 (Spring)		
ARCH 412	Graduate Research Design Studio II	6
ARCH 402	Thesis Research Tutorial	2
FA 100R	Introduction to Techniques	0
	Seminar in concentration	2
	Seminar of choice	2
Total Credits Second Semester		12

Semester 3 (Fall)		
ARCH 413	Graduate Thesis (written or studio)	6

Total Credit Requirement for M.S. Arch. Degree

30

Thesis In April of the spring semester prior to advancing to Arch 413 Thesis, each student will be required to present an elaboration of his or her thesis topic and program for review and acceptance by the faculty. As of Fall 2025, final thesis presentations will be made at the end of the student's second fall semester of study.

Seminars of Choice It is recommended that students register for courses originating in the graduate program (Arch 482, Arch 483 and Arch 485) to satisfy their of-choice seminar requirements.

Graduate courses in the Albert Nerken School of Engineering as well as select upper level undergraduate elective courses could be made available to Master of Science in Architecture students with prior permission from the student's academic adviser and the individual course instructor. Undergraduate courses may be used to satisfy requirements for of-choice coursework only.

SPRING COURSE UPDATES

UNDERGRADUATE REQUIRED

Arch 106: **Concepts of Physics**

An introduction to physics with an emphasis on statics and dynamics. Additional topics include optics, waves and an introduction to structural analysis.

Credits: 3

Arch 111 B: **Architectonics/Semester II**

Introduction to the study of architecture; investigation of the interrelationships of space, structure and visual composition. Exploration of the syntax of architecture. Models and orthographic drawing. *Credits: 4*

Arch 115 B: **History of Architecture I/Semester I**

Introduction to History of Urban Form

The courses of the HTC curriculum provide an introduction to the history of architecture and human settlements with a transcultural perspective, inclusive of diverse canons and traditions. The course sequence addresses architecture's cultural, ideological and material influences and exchanges, as well as the points of rupture throughout history that have determined the development of the field's conceptual frameworks and material instrumentalities. These courses place architectural and urban history and theory in the specific contexts of the various paths of colonization at different moments in history, and will consider the geopolitical influences on principles, concepts, styles and techniques, both within the centers of power and at

the peripheries. This course considers cities as sites of exchange and concentration: of population, social interaction, wealth and opportunity as well as isolation, poverty and exploitation. The course proposes the reading of urban form as a tool for systemic analysis, exploring social, political and economic forces through the materiality of the urban settlement. The focus is on constitutive elements: building typologies; circulation and communication networks; economic exchange; mechanisms of control and conquest; and sites of political representation and cultural expression as determinants of urban configurations. With examples drawn from around the globe, cities are considered in their diverse historical manifestations, urban theory will inform the discussion, especially as late 19th and early 20th century examples are analyzed. *Credits: 3*

Arch 117 B: **Geometry**

Introduction to various geometric logics; methods of graphic description, as well as an introduction to concepts and systems of projection and the two-dimensional representation of three-dimensional form and space. Emphasis on the control, precision, and rigor of the geometric description of form. *Credits: 3*

Arch 121 B: **Design II/Semester II**

Projects comprise elemental architectural programs wherein the student is required to sustain the formal investigations of first year while integrating the complexities of program, context and site. Spatial, structural, material, environmental and visual design are integrated. Emphasis is placed on communicating concepts through drawings and models. *Credits: 5*

Arch 122 B: **Structures I/Semester II**

A qualitative examination of the behavior of structures. Characteristics and development of the stresses generated from the simple to the complex. A study of the materials of construction used in structures. *Credits: 2*

Arch 124 B: **Environments/Semester II**

Introduction of critical issues of the “natural” environment and the recognition of contemporary interior space as a complex environment both mechanical and passive. This class will provide students with a conceptual grounding in environmental issues at the urban and building scales in the second-year curriculum, when complexities of program, context and site are introduced in the studio. The class will be directly aligned with the Design II Spring semester studio, through common faculty and shared projects. *Credits: 2*

Arch 125 B: **History of Architecture II/Semester II**
Socio-Political Movements and Modern Architecture

The courses of the HTC curriculum provide an introduction to the history of architecture and human settlements with a transcultural perspective, inclusive of diverse canons and traditions. The course sequence addresses architecture's cultural, ideological and material influences and exchanges, as well as the points of rupture throughout history that have determined the development of the field's conceptual frameworks and material instrumentalities. These courses place architectural and urban history and theory in the specific contexts of the various paths of colonization at different moments in history, and will consider the geopolitical influences on principles, concepts, styles and techniques, both within the centers of power and at the peripheries. This course examines concepts, designs and built examples of architecture from the 18th to the middle of the 20th century, both within the centers of power and at the peripheries, addressing architectural production (both built and theoretical) since the Industrial Revolution and the rise of the Modern Empire, as well as the Nation State. Architectural theory and built work from this time period will be analyzed, and material choices and structural knowledge examined, in the context of industrial, social, political and philosophical revolutions. *Credits: 3*

Arch 127 B: **Representation IV: Analysis**

Introduction to the representational conventions of architectural analysis. Drawing modes to include plans, sections, elevations and axonometrics. Analytical readings of form, structure, space, program, and site will be explored. Students to achieve the ability to critically interpret architectural precedents through analytical representation. *Credits: 3*

Arch 131 B: **Design III/Semester II**

Study and analysis of historical precedents followed by a sequence of design problems of increasing complexity. Emphasis on the planning of buildings and the interrelationships among form, structure, detail and technologies. *Credits: 5*

Arch 132 B: **Structures II/Semester II**

The study of strength of materials is applied to the quantitative design procedures for wood and steel structures. Students complete individual projects in wood and lowrise steel structures. *2 credits per semester. Prerequisites: Arch 103/104, Ph 165/166, Arch 122 A-B Structures I.*

Arch 133: History of Architecture III**A Critical Study of Architectural Ideologies Post-WWII**

The courses of the HTC curriculum provide an introduction to the history of architecture and human settlements with a transcultural perspective, inclusive of diverse canons and traditions. The course sequence addresses architecture's cultural, ideological and material influences and exchanges, as well as the points of rupture throughout history that have determined the development of the field's conceptual frameworks and material instrumentalities. These courses place architectural and urban history and theory in the specific contexts of the various paths of colonization at different moments in history, and will consider the geopolitical influences on principles, concepts, styles and techniques, both within the centers of power and at the peripheries. This course focuses on the major breaking points in recent history and their influence on architectural discourse and production. The course investigates architectural concepts, movements, and theories of the post-war period that are essential to an understanding of the present moment. Through the analysis of texts, drawings, and built projects, the course will offer a critical study of architecture's relationship to ideology. *Credits: 2*

Arch 134 B: Environmental Technologies/Semester II

Environmental and life safety systems as they affect program and building form, including mechanical (heating, cooling, ventilating), water supply and disposal, electrical, lighting, acoustics, vertical transportation, communication, security and fire protection. Principles of sustainability. Passive and active systems. *Credits: 3*

Arch 135 B: Building Technology/Semester II

Materials and methods of architectural construction, lectures, examination and discussion of classic as well as current building techniques. Students assemble full-size "mock-ups" of details for class study germane to their design classes. In general, this course does not separate "construction" from "design" but attempts to supplement, by a means of a more detailed study of design assignments. Field trips may be made to buildings under construction. *Credits: 2*

Arch 141 B: Design I/Semester IIV

Investigation of urban programs and sites requiring the integration of form, structure and space. Examination of the complexities implicit in the resolution of urban problems. Analytic studies and explorations generate specific programs for development of each project. Emphasis given to large-scale integrations and the impact of urban transformations upon existing fabric. *Credits: 5*

Arch 142 B: Structures II/Semester III

The design of reinforced concrete using stress methods and plastic design is combined with individual projects in low-rise concrete structures. Elements of soil mechanics and soil investigations are included (Fall only) in foundations design.

Prerequisite: Arch 132 A-B Structures II. *Credits: 2*

Arch 143 B: Construction Management/Semester II

Introduction to construction management principles, techniques and methods including scheduling, cost-estimating, planning and controlling construction process. *Credits: 1*

Arch 151 B: Thesis/Semester II

A synthesis of four years' educational experience. The choice of the area of study is the responsibility of the student. The scope of the problem is defined by each student, who also decides on his or her method of exposition. Problems are analyzed and studied with the aid of faculty from each discipline and by visiting critics. *Credits: 6*

Arch 154 B: Professional Practice/Semester II

The role of the architect in relation to the community, client, builder, worker and engineer. Societal, ethical, legal and personal obligations. Office organization and administration. *Credits: 1*

Arch 205: Advanced Concepts

This course is intended to be an advanced course dealing with the relationship between architectural space and some other discipline in the humanities. The course deals with an interdisciplinary approach toward a new poetic and the phenomenology, psychology and metaphysics of space. *Prerequisite: permission of instructor. After fulfilling the Arch 205 Advanced Concepts degree requirement, a student may enroll in other additional Arch 205 Advanced Concepts classes for elective credit. Credits: 2*

Arch 225: Advanced Topics in History, Theory, Criticism

Advanced study in history, theory, criticism of architecture, urbanism and technology. *Prerequisites: Arch 115 A-B, Arch 125 A-B and Arch 175 or permission of the instructor. After fulfilling the Arch 225 Advanced Topics degree requirement, a student may enroll in other additional Arch 225 Advanced Topics classes for elective credit. Credits: 2*

FA 100RB–FA 100RB: Shop Tech

An introduction to the physical aspects of working with wood, metal and plaster (mold making). *1 credit per semester.*

UNDERGRADUATE ELECTIVES

Arch 176: **Theory of Landscape Architecture**

Lecture/studio course explores the interrelationships of nature, site design and built form. Focus on basic elements of nature addressed ideologically, poetically, culturally and practically through an interdisciplinary study of works by selected artists, writers, landscape architects and architects. Work with landscape fundamentals, continue on to more complex issues of natural processes and aesthetics, such as atmosphere, ephemerality and time, and of site planning, such as site selection, topography, drainage, ecology and climate, especially as related to architecture and art in the land. *Credits: 2*

Arch 177: **Computer Graphics, Image Processing and Vision**

Introduction to basic concepts of spatial description and manipulation by computer enables student to use these techniques as an aide in problems of formal spatial drawing with a computer. Examination of the issues of “hand-eye axis” in computer-based drawing and “paint” systems as well as more abstract algorithmic methods of drawing. Image acquisition and transformation by computer, its relation to computer vision and control of robots and machines which build will be another area of emphasis. Survey of a wide variety of applications including typeface design, page layout and make-up, animation and interactive control of video systems. *Credits: 2*

Arch 178: **Advanced Drawing Seminar**

The course will focus on the dialogue between figuration and abstraction. Students will be expected to plan and elaborate an ongoing series of drawings. The class will meet on a seminar basis to critique work in progress and to discuss issues relevant to the language of drawing. There may be an open studio available for those students who wish to pursue drawing from the model. However, students will be encouraged to investigate a broad spectrum of imagery and materials. *Prerequisite: permission of instructor. Credits: 2*

Arch 199: **Architecture Independent Study**

Objective: The purpose of this Independent Study is to allow students to pursue an independent study or research project outside their regular coursework, in order to delve more deeply into a specific topic of interest. An Independent study may be taken under the supervision of a member of the resident faculty (defined as full-time or proportional-time faculty members) or adjunct faculty members who have taught at the School of Architecture for at least 6 semesters. The faculty member—who becomes the advisor for the independent course—must approve the proposed study and agree to provide continuing supervision of the work.

Eligibility: Only students in fourth and fifth years in good academic standing (defined as having earned a minimum 3.25 G.P.A. overall for the previous semester) are eligible for independent study. Independent study may be taken only once during a semester in an advanced subject for two (2) credits. One (1) credit of independent study represents a minimum of three (3) hours of work during each week of a 15-week semester.

Application procedure: The major consideration in approving proposals for independent study is the educational value of the study project within the structure of the degree requirements as well as the student having successfully completed any relevant introductory coursework in the topic proposed. Before applying for an independent study, eligible students should contact the faculty they wish to consider as an advisor to discuss their proposal.

1. The selected faculty advisor must be teaching in the School of Architecture during the semester in which you wish to enroll (a professor on leave may not supervise an independent study).
2. The student writes a one-page proposal for the course including a concise description, deliverables, workplan, schedule and preliminary bibliography and describe previous coursework in the proposed topic as well as the educational value of the selected topic of interest.
3. The student selects a faculty adviser who must sign off on the proposal
4. The student submits the signed proposal to the Dean for review in consultation with the faculty member.
5. Approval of the Independent Study based on merits of proposal and availability of funds to compensate faculty member in compliance with CUFACT/CUOP contract.
6. Once approved, student will receive permission to register for ARCH 199.

Credits: 2

GRADUATE REQUIRED

Arch 401: **Proseminar**

An introduction to research in architecture and urbanism: theory, research (methods and techniques) and writing, for M.Arch. II degree students only. Selected readings in historiography, theory, criticism and design and methods. Includes lectures and seminars by faculty and visiting specialists in the fields of history and criticism, architecture and urban design methods, research in representational techniques, digital technology, etc. Presentations by each student in the program will encourage interdisciplinary comparison and shared knowledge. *Credits: 2*

Arch 411: **Graduate Design Research Studio II**

Individual design projects within general guidelines established by the faculty, each emphasizing the special area(s) of research of the student. *Credits: 6*

Arch 482: **Graduate Seminar in Technologies**

Selected topics in the advanced study of technological issues in architectural design, representation, materials, planning, production and construction. Open to undergraduate fourth- and fifth-year architecture students as an elective with permission of the instructor and the dean. *Credits: 2*

Arch 483: Graduate Seminar in Urban Studies

Selected topics in the advanced study of urban form including readings and case studies in urban analysis, global development, historic preservation and typological transformation. Open to undergraduate fourth- and fifth-year architecture students as an elective with permission of the instructor and the dean. *Credits: 2*

Arch 485: Graduate Seminar in Theory, History and Criticism of Architecture

Selected topics in the advanced study of the theory and criticism of modernism and contemporary architecture, the philosophy and aesthetics of architecture, the mediatization of architecture and broader cultural and historical issues, through the critical readings of texts as well as case studies. Open to undergraduate fourth- and fifth-year architecture students as an elective with permission of the instructor and the dean. *Credits: 2*

Arch 499: Architecture Independent Study

Objective: The purpose of this Independent Study is to allow students to pursue an independent study or research project outside their regular coursework, in order to delve more deeply into a specific topic of interest. An Independent study may be taken under the supervision of a member of the resident faculty (defined as full-time or proportional-time faculty members) or adjunct faculty members who have taught at the School of Architecture for at least 6 semesters. The faculty member—who becomes the advisor for the independent course—must approve the proposed study and agree to provide continuing supervision of the work.

Eligibility: *Only graduate students in good academic standing (defined as having earned a minimum 3.25 G.P.A. overall for the previous semester) are eligible for independent study (which means that graduate students become eligible for Independent Study starting in their second semester of study). Independent study may be taken only once during a semester in an advanced subject for two (2) credits. One (1) credit of independent study represents a minimum of three (3) hours of work during each week of a 15-week semester.*

Application procedure: *The major consideration in approving proposals for independent study is the educational value of the study project within the structure of the degree requirements as well as the student having successfully completed any relevant introductory coursework in the topic proposed. Before applying for an independent study, eligible students should contact the faculty they wish to consider as an advisor to discuss their proposal.*

- 1. The selected faculty advisor must be teaching in the School of Architecture during the semester in which you wish to enroll (a professor on leave may not supervise an independent study).*
- 2. The student writes a one-page proposal for the course including a concise description, deliverables, workplan, schedule and preliminary bibliography and describe previous coursework in the proposed topic as well as the educational value of the selected topic of interest.*
- 3. The student selects a faculty adviser who must sign off on the proposal*
- 4. The student submits the signed proposal to the Dean for review in consultation with the faculty member.*
- 5. Approval of the Independent Study based on merits of proposal and availability of funds to compensate faculty member in compliance with CUFACT/CUOP contract.*
- 6. Once approved, student will receive permission to register for ARCH 499.*

Credits: 2

SCHOOL OF ART

CURRICULUM

The goal of the BFA program is to educate students in the skills, knowledge, and understanding necessary for professional practice in art- and design-related fields. Our integrated curriculum educates students in specific fine arts disciplines but also in the complex interrelation of all visual vocabularies. Through courses in the humanities, the social sciences, the sciences, and the history and theory of art, the program invites students to expand their studio education across disciplines and subjects.

The first year Foundation Program is designed as a basis for the educational program of the School of Art and is intended to prepare students for studies in all the disciplines offered within the curriculum. Through exposure to a variety of two-, three-, and four-dimensional projects, students are given a general introduction to the specifics of visual and spatial phenomena, and to concepts, principles, and techniques of the visual arts. Required courses in the history and theory of art, and in Cooper Union's unique humanities and social sciences "core" sequence, introduce critical thinking and writing as a necessary part of artistic practice.

Following the completion of the Foundation Program, sophomore students may choose courses in the disciplines of drawing, audiovisual, graphic design, painting, photography, printmaking, and sculpture. Elective studio and techniques classes are also offered on a rotating basis. Since the prerequisite studio courses students take in sophomore year will in large part determine their options for advanced study, students are encouraged to choose a variety of areas in consultation with their instructors and advisors. A continuing involvement in general academic studies serves as a tool to broaden each student's developing studio experience across histories of ethics, social agency, and human expression.

In junior year, students experience increased freedom and flexibility to determine the depth and breadth of their advanced studies. Students are encouraged to use general academic studies electives, along with elective courses offered by the Schools of Architecture and Engineering, as a basis for the self-directed inquiry which is an integral part of making art.

Seniors work with the highest degree of autonomy, taking advanced courses based on their sophomore and junior prerequisites, expanding both technical aptitude and critical dexterity, and developing a continuous studio practice. The Senior Presentation is an opportunity for a public showing and telling of this work, and, together with projects across the curriculum, provides a context through which students prepare for work and life after Cooper.

Since each transfer student arrives at the School of Art with unique experiences and background, they work closely with their advisors to determine the appropriate academic trajectory.

Students may enroll in advanced studio classes with the same course number multiple times. Instructors and syllabi in these courses will vary. In addition, the content of advanced studio classes changes with the mix of students in each class. Consequently, the development of individual students' work varies with the inter-change of ideas among these students and their instructor. The School of Art believes that the ability to work with the same instructor in the same discipline multiple times (even as the course content changes) can foster a valuable mentoring relationship between an instructor and an advanced student.

ACADEMIC STANDARDS AND REGULATIONS

Independent Study Independent study in a School of Art subject is an alternative to classroom study and may be taken only with a member of the resident faculty (defined as full-time or proportional-time faculty members or adjunct faculty members who have taught at the School of Art for at least seven semesters). Only juniors and seniors in good academic standing are eligible for independent study. Independent study in a School of Art subject may be taken only once during a semester for one, two, or three credits. One credit of independent study represents a minimum of three hours of work during each week of a 15-week semester.

The following additions are implemented to the Independent Study Policy, effective Fall 2026:

- To be eligible for an Independent Study, Juniors must have previously taken a course with the faculty member they wish to work with.
- Seniors may request an Independent Study with a faculty member they have not studied with before; however, this is limited to 1 credit.
- A student is not eligible to do an Independent Study with a faculty member with whom they are currently enrolled in a course.

The major considerations in approving proposals for independent study are the educational value of the study project within the structure of the degree requirements and relevance to ongoing studio practice as encouraged by faculty. Permission to undertake independent study off-campus can be given only when it is required by the nature of the specific project and when the experience has been evaluated to be valid by the instructor and approved by the Office of Academic Advising & Off-Campus Programs.

School of Art students who wish to apply for independent study in a Faculty of Humanities & Social Sciences subject should refer to the FHSS policy.

Degree Requirements for All Students

Prerequisite and Advanced Studio Courses The student's choice of studio courses is based on individual interest in various disciplines, on prerequisite courses for advanced areas of study and on the student's interest in working with particular instructors. Students are required to complete 54 credits.

There are limitations on the number of credits a student may take each semester in any one area of study, depending upon the student's progress in the program (number of credits completed toward the degree). The number of credits allowed is determined as listed below:

Credits Completed	Maximum Credits per Semester per Area of Study*
30-32 (Sophomore)	6
60-64 (Junior)	9
90-96 (Senior)	no limit

*Includes related techniques and seminar courses

Exchange Program The School of Art offers a number of exchange programs with schools abroad. They currently include opportunities for a junior-year semester of study in the Czech Republic, England, France, Germany India, Israel, Japan, Mexico, the Netherlands, Spain, or Sweden. Students should consult the Office of Academic Advising & Off-Campus Programs as early as possible for information about these exchange opportunities.

COURSES

Audiovisual

FA-272 **Film**

This course is designed to foster independent student projects made using 16mm film. Alongside practical instruction into working with film, students will be exposed to the multiple and overlapping histories and practices of analog filmmaking. In-class workshops, discussions, and screenings will cover experimental, documentary, and narrative filmmaking strategies, toward providing students with a broad framework from which to make work. Students use Bolex 16mm cameras and black and white film in this course. Editing and post-production instruction includes analog and digital workflows. *Spring 2026. May be repeated. Pre-Req: AV I. Credits: 3*

FA-276 **Audiovisual II**

Audiovisual II is the second semester of a two-semester trajectory. The course is designed for students to further their exposure to important concepts, production techniques, and histories of artists' sound and moving image work, while developing the tools to work independently in the audiovisual realm. With an emphasis on students developing longer form prompted and self-generated projects, AV2 will delve further into both conventional and experimental techniques of moving image and sound recording, assembly, editing, post-production, lighting, and installation. Through classroom instruction, screenings, guest artist visits and group critiques, students will experiment with multiple modes of making, while also evolving critical thinking and language in which to conceptualize, make, and share with the larger class and school community their time-based work.

Fall 2025/Spring 2026. May not be repeated. Pre-Req: AV I. Credits: 3

FA-376 **Animation**

This class is devoted to the study and practice of frame by frame filmmaking. Alongside an examination of historic and contemporary examples of the wide and often experimental world of animation, students will engage in animation exercises and practical in-class demonstrations, ranging from traditional cartoon studies to fine art-based and experimental animation. Students create the initial artwork for their animations physically "with their own hands" and complete them digitally using the AV department's animation facilities. Animation forms explored over the semester include direct-on-film, roto-scoping, 3D stop-motion, hand-drawn and 2D under-the-camera. *Spring 2026. May be repeated. Pre-Req: AV I. Credits: 3*

FA-385: Installation

This advanced course investigates video installation as an evolving contemporary art form that extends the conversation of video art beyond the frame and into hybrid media, site-specific, and multiple channel environments. Presentations, screenings, and readings augment critical thinking about temporal and spatial relationships, narrative structure, viewer perception and the challenges of presenting time-based work in a gallery or museum setting. Students will develop research interests and apply their unique skill sets to short turnaround exercises and more expanded self-directed projects for gallery and non-theatrical contexts.

Spring 2026. May be repeated. Pre-Req: AV I and Pre/Co-Req: AV II. Credits: 3

FA-389 AV Projects Guest Artist

This course is intended to help students clarify and further the growth of their own work through group and individual critiques, classroom presentations and discussions with contemporary guest artists and the instructor.

Spring 2026. May be repeated. Pre-Req: AV I and Pre/Co-Req: AV II. Credits: 3

Drawing

FA-345 Drawing: Open Studio

This studio-based course makes space for a diversity of approaches to drawing or drawing across disciplines. Students work and share individual and self-directed making with guidance from faculty. Students navigate their chosen path of making within the context of presentations, group, and individual meetings with faculty. The course may include inclass workshops, homework assignments, presentations, individual or group projects, and discussions. Attendance is mandatory. Independent studio work is required. Group participation may be required. *Spring 2026. May be repeated. Credits: 3*

FA-346A Drawing In-Practice: Reskilling

Hands-on workshops, lectures, assignments individual and group discussions/ meetings centered in questions of mastery and deskillling in contemporary making practices. The course asks students to experiment, innovate and develop in their drawing process by exploring histories, innovations and ruptures in art that have shaped notions of “craft” or “skilled” making. *Spring 2026. May be repeated. Credits: 3*

FA-347 Colorlines: Social and Perceptual Activations in Line and Color

This course explores the social and perceptual dimensions of line and color in the world and in art making. The provisional and fugitive experience of line and color expands possibilities in drawing practice and across disciplines. The course may include in-class workshops, homework assignments, presentations, individual or group projects, and discussions. Attendance is mandatory. *Spring 2026. May be repeated. Credits: 3*

FA-348 The Urban Studio: Drawing and Non-traditional Materials

This course explores non-traditional art materials considering how nonstudio-based making informs studio practice. Provisional making, notation and fugitive experience expand possibilities in drawing practice and across disciplines. The sustainable and metaphorical attributes of material will inform course discussions. The course may include in-class workshops, homework assignments, presentations, individual or group projects, and discussions. Attendance is mandatory. *Spring 2026. May be repeated.*

Credits: 3

Graphic Design

FA-212 Graphic Design II

The complex relationship between word and image is explored. The study of semiotics, emphasizing the philosophy of communication, provides a rich historical and intellectual base for projects combining verbal and pictorial information. Building on the aesthetic and technical skills learned in Graphic Design I, assignments reflect a range of disciplines within the design field with an emphasis on the use of design to distill and interpret complex information and the creation of dynamic and integrated graphic systems. Computer instruction will be provided as it relates to specific projects.

Spring 2026. May not be repeated. Credits: 3

FA-316 Data Science and Design Projects for Social Good

Applications of data visualization, machine learning, and software engineering to projects in the areas of education, equality, justice, health, public safety, economic development or other areas. Projects will be done in collaboration with external partners, and will be focused on solving problems with an emphasis on the greater New York City Area. Students will work with the external partners to specify problems and investigate possible solutions. Students will work between disciplines to develop new machine learning based solutions and work collaboratively to visually convey the insights and results generated.

Spring 2026. May be repeated. Pre-Req: GD II and Pre-Co-Req: Typography. Credits: 3

FA-317 Advanced Design: Open Studio

This class gives students an opportunity to conduct investigations of their own choosing through a series of open-ended prompts. We will look at the wide range of methods used in contemporary design practice and investigate ways they can be used to generate your own work. Projects include expanding on a past project, accumulating a series of daily acts of design, and creating a format to house contributions solicited from classmates. We will discuss a variety of techniques for creating self-generated work with a focus on how projects can be presented and circulated. Students will be required to share their explorations in carefully designed and clearly articulated

presentations. Visiting lectures, videos, and readings will complement group critiques and one-on-one meetings.

In this course students will complete two fully realized independent projects. Emphasis will be placed on contemporary graphic design and typographic practices and on developing a personal voice and aesthetic. Students are expected to regularly present their works-in-progress and to participate actively in class discussions. Visiting lecturers, readings, and individual meetings with the instructor will complement group critiques.

Fall 2025/Spring 2026. May be repeated. Pre-Req: GD II and Pre/Co-Req: Typography. Credits: 3

FA-324 **Advanced Design: Product Design**

In this course, students will learn how to critically conceptualize, develop, and iterate on interactive web-based products. Through a mix of lectures and tutorials, we will explore the web as a creative medium and investigate past and present efforts that expand on and challenge the product design process. Projects will be guided by comprehensive research, wire-framing, and developing an interactive system using both prototyping software and basic HTML, CSS, and JavaScript. No prior coding experience is required.

Spring 2026. May be repeated. Pre-Req: GD II and Pre-Co-Req: Typography. Credits: 3

FA-325 **Advanced Design: Advocacy through Type and Symbols**

This course leverages the power of typography and symbol to inform and persuade viewers. An investigation into the history, scale, and diversity of publishing formats—from print through digital—from book through social media—offers students an opportunity to consider the most effective means of transmitting messages that they deem timely and relevant. The theme of advocacy, in context to how specific typographic, symbolic, and aesthetic formats are chosen, will then be supported by considerations of touchpoint: how the intended recipient is exposed to the message. A full range of communication will be considered—from working for clients to creating a powerful, personal voice. Traditional and contemporary research protocols will also be investigated.

Spring 2026. May be repeated. Pre-Req: GD II and Pre-Co-Req: Typography. Credits: 3

Painting

FA-130B **Painting II**

This course is centered around the material, conceptual and historical concerns of painting media within individual studio practice. There is an emphasis on individual projects or assignments and the studio as generative space. The course is intended to clarify and evolve each student's individual relationship with paint media in preparation of advanced study in painting. Individual studio critiques and group critiques will enhance the development and articulation of each student's concerns in painting and image-making. The objectives of the course will be supported by readings, films, lectures and field trips that expand the historical and contextual understandings in the practice of painting. *Spring 2026. May not be repeated. Pre-Req: Painting I. Credits: 3*

FA-331 **Advanced Painting**

This course offers students individual and group contexts to discuss their work and personal development as an artist. Students engage with relevant, practical, historical and contemporary discussions around painting. Clarification of interests, content, material processes center students within the context of advanced study. Individual and group critiques offer students opportunities to further locate their practice and voice as an artist. Various media and experiences such as lectures, films, reading and field trips expand classroom and individual studio space learning.

Fall 2025/Spring 2026. May be repeated. Pre-Req: Painting I and Pre/Co-Req: Painting II. Credits: 3

FA-339 **Advanced Painting: Katz Guest Artist Series**

The Katz Guest Artist Series is named after and funded by Cooper Union alumni Alex Katz. This course introduces contemporary emerging and established artists in the fields of Painting & Drawing guided by a Cooper Union faculty. The course offers students opportunity for further growth within the context of advanced study through conversations around professional practices and individual development. Students interact with each guest in lectures, one-on-one studio visits and group critiques. Lectures introduce students to a wide range of practice and perspectives in Painting or Drawing within a classroom setting or field trips to guest artist studios. There is time for critical discussion about the material presented. Individual studio spaces become sites for creation, research, presentations and meetings with faculty and guest artists. In this way, the course reflects the professional space of the artist studio. Students develop a deeper connection to their personal language and practice through a rigorous studio visit and lecture schedule. Students experience the "real world" model of studio visits in which visitors not familiar with their work or immediate concerns engage them. In this way students develop the communication of their work and interests outside of the traditional classroom structure. Group critiques and media such as readings and film expand and clarify student development and course objectives.

Fall 2025/Spring 2026. May be repeated. Pre-Req: Painting I and Pre/Co-Req: Painting II. Credits: 3

Photography

FA-206 **Lens/Screen/Print I**

LSP I Lens/Screen/Print I is the first section of a two-semester trajectory. This is an immersive foundation course in the practice of photography focusing on a critical engagement with lens technology, color theory/management and combined analog/digital workflows. Topics include: exploratory and technical knowledge of 35mm analog cameras, DSLR cameras, lenses and lighting conditions, fluid movement through digital black-and-white and color processes, such as digital imaging editing software, scanning analog color, and digital printing in black-and-white and color. Exposure to critical theory and major philosophical arguments central to lens, screen and print based practices will be explored. This is an assignment driven class.

Fall 2025/Spring 2026. May not be repeated. Credits: 3

FA-207 **Lens/Screen/Print II**

Lens/Screen/Print II is the second half of a two-semester trajectory. This course builds upon the foundations of LSP I with an emphasis on post-production and a critical engagement with lens technology, color theory/management and combined analog/digital workflows. Technical knowledge of the tensions and possibilities found between “digital” and “analog” spaces in relation to critical theory and major philosophical arguments central to lens, screen and print based practices will contribute to student development. Topics include advanced digital editing and printing techniques, analog black-and-white production methods, such as shooting with black-and-white film and darkroom printing, advanced medium-format cameras and scanners, as well as introduction to new technologies and modes of display. A distinction in LSP II is a focus on experimentation, articulation and acumen. Students are encouraged to begin to develop semi-autonomous ways of working over the course of the semester, this includes supervised independent or collaborative projects. This course will afford students the opportunity to build a coherent body of work in preparation for advanced study.

Fall 2025/Spring 2026. May not be repeated. Pre-Req: L/S/P I. Credits: 3

FA-362 **Photography: Studio Lighting**

The course will primarily address lighting, including the use of hot lights, flash, and strobes, with specific studio equipment such as sweeps, diffusers, backdrops, tethered shooting, Lightroom, and Capture One. Retouching and color correction in Photoshop will be covered.

Spring 2026. May be repeated. Pre-Req: L/S/P I and Pre/Co-Req: L/S/P II. Credits: 3

FA-364 Advanced Photography: Open Studio

Students will advance their practice by producing work using photographic material(s), cameras or any photographic device of their choice. Work will be discussed in group critiques as well as individual conferences with the instructor. Photographic issues and representation will be the subject of readings and class discussions.

Fall 2025/Spring 2026. May be repeated. Pre-Req: L/S/P I and Pre/Co-Req: L/S/P II. Credits: 3

Printmaking

FA-250 Screen Printing

This introductory course covers all aspects of contemporary Screen printing as a photomechanical stencil printing method. In a series of demonstrations, lectures and projects, students will become familiar with stencil making, color separation, printing, color mixing and image registration with the goal of building a broad knowledge of Screen printing. Methods for producing images by hand and by computer output are both addressed. Attention will be paid to the use of Screen printing within fine art, design and popular culture spheres as a way of discussing the history and current use of the process. *Fall 2025/Spring 2026. May not be repeated. Credits: 3*

FA-251 Lithography

This is a comprehensive course covering the full range of lithographic techniques. Instruction begins with hand working processes on lithographic stones and progresses through to contemporary approaches of digital image preparation for output to photographic printing plates. A series of projects and critiques are targeted to develop command of the material process and place the use of Lithography in contemporary visual practice. *Fall 2025/Spring 2026. May not be repeated. Credits: 3*

FA-252 Etching

This course is an introduction to the process of etching and printing from metal plates. Topics covered are the full range of platemaking techniques, from traditional wax grounds to contemporary photographic grounds, and printing techniques, including chine-collé, multi-plate color work and surface rolling. Lectures and critiques will place the practice of Etching in historical and contemporary context.

Fall 2025/Spring 2026. May not be repeated. Credits: 3

FA-253 Paper: Materiality and Sustainability

This studio course explores making paper from traditional to contemporary approaches. The course incorporates specified instruction and experimentation driven by student independent projects. The exploration of the structural and historical uses of Western and Eastern methods including contemporary issues of recycled and alternative fibers will frame an understanding of the potential uses and appearances of handmade paper. From a basis in sheet forming, pigmenting, sizing, and the use of additives, the class will move into an emphasis on paper as a visual and sculptural object, covering paper casting and other three-dimensional approaches.

Fall 2025/Spring 2026. May not be repeated. Credits: 3

FA-354 Experimental Printmaking

This course is focused on advanced studies across all forms of print media toward the development of individual student work. Instruction will build on the introductory level courses, covering color separations, extended techniques, experimental approaches, and additional print media forms. Student development will be driven by individual meetings and a series of group critiques. *Fall 2025/Spring 2026. Pre-Req: 2*

Printmaking Classes (Etching, Lithography, Relief, Paper: Materiality and Sustainability, or Screen Printing). Credits: 3

FA-355 Relief

This course provides an introduction to Relief printing techniques. Projects will cover hand carving wood and alternative surfaces, with specific attention to the Japanese water-based woodblock tradition and the western oil-based tradition. Instruction will cover printing by hand, as well as printing on Etching presses, hydraulic presses and Letterpresses. *Fall 2025/Spring 2026. May not be repeated. Credits: 3*

Sculpture

FA-39: Sculpture: Open Studio

In this course “Sculpture” will be understood as open to an expansive and changing definition of its limits. Students may draw from its historical traditions or choose more experimental modes of production, in other media or methodologies. The course will be structured as an open studio, where students can bring in works as they progress through each individual’s studio thought and experiment. Students are expected to work independently in initiating their research, concepts, choice of mediums, and the installation/context for their projects.

Fall 2025/Spring 2026. May be repeated. Credits: 3

FA-392 Sculpture: Reasoning with Things

This is a sculpture studio course that takes a concrete approach to the development of critical discourse about works of art through making and discussing objects. It exercises the student's ability to analyze the activity of making sculpture in particular - and advances the student's understanding of how to proceed in the studio.

Problems of structure, materials, meaning, intention, and context are the subjects of class discussion. Together we will look at examples of artists practice which fall within these themes, visit related exhibitions, and host visiting artists.

Spring 2026. May be repeated. Credits: 3

FA-393 Sculpture: Making, Craft, and Concept

This course will emphasize a balance between craft and concept in making Sculpture as creative acts that produce physical interventions in the world. Unlike other courses, we will work closely with the 4th floor Shop facilities to explore how a combination of woodworking, metalworking, casting, as well as other fabrication methods (plastics, sewing, new technologies, etc.) can facilitate and expedite each student's vision.

Students are expected to be self-driven and self-motivated with their projects. They are interested in working on over the semester. This class will help reinforce their technical and material research in completing complex fabrication. Skills will be learned as well as built upon, and workdays will be integrated into class time to get as much hands-on experience as possible. *Fall 2025/Spring 2026. May be repeated. Credits: 3*

FA-394 Sculpture: Narrative and Systems

This is a sculpture studio course. While all media are welcome, we will approach the course with sculptural concerns. The theme of the class is Narrative and Sculpture with a focus on Relationships to Systems. This class is loosely defining a system as a group of interacting or interrelated elements that act according to a set of rules to form a unified whole. The class is broken into three ways of exploring this theme: artists intervening within existing systems; artists reinventing or creating their own systems; artists displacing or circulating material from one system to another. Together we will look at examples of artists practice which fall within these themes, visit related exhibitions, and host visiting artists. Throughout the class, students will make their own works or projects with these themes in mind.

Fall 2025/Spring 2026. May be repeated. Credits: 3

Studio Electives

FA-281 **Project in Sound Art**

This class will introduce strategies for understanding and participating in the aural world. The course is divided into specific weekly topics including acoustic ecology, radio transmission, and others. Screenings, readings, and discussion are supported by hands-on workshops in capturing, manipulating, and reproducing sound in unconventional ways. Grading is based on student projects and participation in class discussions. *Fall 2025/Spring 2026. May not be repeated. Credits: 3*

FA-327 **Computational Studio: Digital Fabrication**

This course provides a comprehensive introduction to digital fabrication and is designed to augment existing practices through access to new tools, materials, and concepts for art production. Students will learn fundamental skills and will utilize a variety of digital fabrication methods including 3D printing, laser cutting, and CNC machining, along with software & capture methods such as: Rhino 3D and 3D scanning. In the first half of the course, students will learn fundamental digital fabrication skills through technical demos and technique-oriented projects. In the second half of the course, students will develop a body of work utilizing these tools. We will move between computer classrooms, the AACE lab, and individual studios to explore topics such as built environments, sculptural methods, and medium specificity. As background, we will explore the history of digital fabrication, and ask critical questions about its relevance and impact on creative industries and society more broadly.

Fall 2025/Spring 2026. May be repeated. Credits: 3

FA-384 **Projects**

Students work independently on self-initiated projects under the guidance of professors and visiting artists. *Fall 2025/Spring 2026. May be repeated. Credits: 3*

FA-384B **Projects: Change the Register**

This course will make evident that there are inquiries set within institutions and other set outside of them. The class will create space so that students can make installations that move people around, through different ways of perceiving: coding and recoding, being differently affected, placed, and displaced. The switching of registers in the students' work will be emphasized because layered apprehension can produce new knowledges. Group critiques, lectures, readings, and class discussion will provide alternative ways of locating personal investments in the making of art pieces. *Spring 2026. May be repeated. Credits: 3*

FA-395 Performance

This class aims to develop and expand the student's performance practice, technically as well as conceptually, while bringing up current debates and questions in performance. This performance class is offered according to themes devised by each individual instructor. Students are encouraged to develop semiautonomous ways of working over the course of the semester, this includes supervised, independent or collaborative projects. This course will afford students the opportunity to build a coherent body of work. *Spring 2026. May be repeated. Credits: 3*

FA-399B Special Topics: Artists as Writers

Writing is an activity of thought manifesting in many forms. Words are gestures are images are letters in artists' ongoing transdisciplinary projects. The common definition of Poetics often limits the plural noun to poetry, but the methods of writing poetry can be applied to any discipline.

Poetics describe the way we put stuff together. Just as drawing can be a form of thinking, writing is a method that transcends communication. We write the world we inhabit. The way we author our world is a matter of Poetics.

Spring 2026. May be repeated. Credits: 3

Electives

RS-201-I Science: Properties of Ceramic, Metals, and Glass

In this course students will gain an understanding of the fundamental similarities and differences between ceramics, metals and glass. Through first exploring the crystalline unit structures of each material on a microscopic level, students will learn about the related material characteristics, working properties, and ultimately manufacturing techniques on a macroscopic level. Then we will focus on causes of degradation of each material with particular attention to pollution, the life cycle of the materials, and the resulting chemical reactions from the inorganic materials and the interactions with their environments. Project based work will serve as a focal learning tool with independent research and weekly in class hands on work and discussions. Students will recreate, observe, and document degradation properties through accelerated aging of metals. Sustainability, sustainable development, and our mindsets towards changing our behaviors in favor of lower environmental impact choices will be a continual thread throughout the semester. Students will evaluate a carbon calculator at the beginning and at the end of the class, and will work on an independent assignment where they will explore material production, use, atomic structure, degradation mechanisms, how the climate crisis threatens our cultural heritage, and experimentation of artists materials as a driving force for technological advancements.

Fall 2025/Spring 2026. May not be repeated. Credits: 3

RS-201J Science: Environmental Science

Environmental science is the study of Earth's environment and the complex relationships between the solid Earth, its air and water, and the living organisms inhabiting the planet. This introductory course will focus on the core concepts in environmental science and the most important issues that scientists and environmentalists deal with today. Drawing on many disciplines, including geology, chemistry, ecology, geography, economics, public health and others, the course will explore the scientific principles, concepts, applications and methodologies required to understand the complicated interrelations of the natural world. It will identify and discuss environmental problems, natural and human-made, evaluate the relative risks associated with these problems and examine alternative solutions.

Spring 2026. May not be repeated. Credits: 3

RS-201K Science: Physics for Artists

This course will study the physics of Newton and his followers, although it will touch on some of the more modern topics, such as relativity and quantum mechanics. The course will concentrate on the basic things that shape our world, such as forces, momentum and energy. Knowledge of center of mass might help a sculpture stand rather than fall. Gravity plays a role even in the visual arts--we often put more massive objects near the bottom of the frame. Equations will be used to show how physicists can make statements with confidence, but the main thrust of the course will emphasize the ideas behind equations.

Spring 2026. May not be repeated. Credits: 3

TE-390 Casting Techniques

Casting Techniques is a process intensive course covering the methods of translating a wax positive into bronze or other non-ferrous metals. All associated techniques from beginning a plaster or rubber mold to casting, chasing, finishing and patination of metal sculptures will be covered. Students will explore a variety of approaches to casting, as well as engage in discussions involving the history of bronze casting, and its place in contemporary art. *Fall 2025/Spring 2026. May not be repeated. Credits: 2*

SE-401 Contemporary Art Issues

This seminar addresses issues essential to an understanding of contemporary aesthetic thought and critical practice as explored by artists and theoreticians. Integral to this discussion is an examination of the role of art in contemporary society, the changing concept of the avant-garde and the relationship of art to culture. The format of the seminar provides for required readings, oral and written reports, guest speakers and regular museum and gallery visits.

Fall 2025/Spring 2026. May be repeated once for Art History credit. Credits: 2

TE-217 Painting Techniques and Materials

This course provides training in the safe handling of painting materials, contemporary applications and techniques in oil- and acrylic-based media. Practices in color mixing, color matching, glazing, uses of supplementary media, creating textures, effects, surfaces and customizing paint from dry pigments will be covered through instructor lead demonstrations and assignments. Students will receive hands-on practice with various techniques by producing original works. In addition, students will be introduced to the origins, history and contemporary evolution of paint as a material. Relevant examples will be presented through various media and field visits.

Spring 2026. May not be repeated. Credits: 2

TE-272 Metal Fabrication

This is a process-intensive course exploring various methods of forging and fabrication across a broad range of methods. A diverse range of Metalworking tools will be introduced to give students the capability of forming steel through forging, blacksmithing, gas and arc welding, and machine tooling. The material's properties and transformation will be discussed in relationship to histories of use—both in art making and as an industrial material, expanding studio practices in concordance with the wider curriculum, and the broader field of fabrication now used in much contemporary art and design. *Spring 2026. May not be repeated. Credits: 2*

SE-402 Drawing Seminar

This seminar-based course offers students the opportunity to develop an individual drawing practice and across disciplines within a lecture or workshop style classroom environment. Faculty guide students through one-on-one discussions and classroom presentations. The student will need to prepare work for studio visits. Long-form projects are not required. The course may include a series of in-class workshops, group activities, presentations, and group discussions. Attendance is mandatory. In-class participation is required. *Spring 2026. May be repeated. Credits: 2*

FA-349 Senior Presentation Project

A public presentation of each senior student's work, normally in the student's final semester, is a requirement for graduation. Each student may satisfy this requirement with an exhibition or, where appropriate, a screening, performance, or publication. No student will be permitted to receive a degree unless this requirement is completed to the satisfaction of the faculty and the dean of the School of Art at a mutually agreed upon time and venue. *Spring 2026. Credits: 0*

ALBERT NERKEN

SCHOOL OF ENGINEERING

Overview

With an average enrollment of about 450 undergraduate students, engineering is the largest of The Cooper Union's schools. The school maintains small class sizes in courses and laboratories in order to provide for personal attention. It offers a bachelor of science (B.S.) degree program in computer science and bachelor of engineering (B.E.) degree programs in chemical, civil, mechanical and electrical engineering. The Chemical Engineering Program is accredited by the Engineering Accreditation Commission of [ABET](#), under the commission's General Criteria and Program Criteria for the Chemical, Biochemical, Biomolecular and Similarly Named Engineering Programs. The Civil Engineering Program is accredited by the Engineering Accreditation Commission of ABET, under the commission's General Criteria and Program Criteria for the Civil and Similarly Named Engineering Programs. The Electrical Engineering Program is accredited by the Engineering Accreditation Commission of ABET, under the commission's General Criteria and Program Criteria for the Electrical, Computer, Communications, Telecommunication(s) and Similarly Named Engineering Programs. The Mechanical Engineering Program is accredited by the Engineering Accreditation Commission of ABET, under the commission's General Criteria and Program Criteria for the Mechanical and Similarly Named Engineering Programs.

The Computer Science (CS) Program was launched in 2024 and will admit the first class in September of 2025. Like the other engineering majors, the computer science program integrates theory with practical application from the onset, starting with collaborative projects in the first year and progressing through specialized projects. Students develop industry-ready skills by focusing on group dynamics, project management, software development, debugging, and presentation skills modeled on real-world practices and enhanced through experiential learning opportunities. Key focus areas include artificial intelligence, cybersecurity, robotics, distributed systems, and user-centric computing.

The integrated master's program offers the opportunity to earn both a bachelor's and a master's degree in an engineering discipline at The Cooper Union within four, five or six years.

Degree programs are designed to prepare students to enter the workplace immediately after graduation or to pursue graduate study. An extraordinary number of Cooper

Union engineering graduates go on to earn Ph.D. degrees at the nation's most prestigious graduate schools. Others go on to study in fields such as medicine, law or business. Many graduates rise to leadership positions in industry, education and government.

The early curricula are based on intensive study in the sciences, mathematics, computer science and engineering sciences, which serve as preparation for deeper immersion within the engineering fields. Building on this strong base of mathematics and sciences, and emphasizing the integration of knowledge, these curricula promote an understanding of nature, the limitations of our present knowledge and the potential for advancing that knowledge.

Defining characteristics of the School of Engineering's programs are the emphasis on project-based learning and opportunities for undergraduate research. Students and their peers regularly join the faculty in solving real-life problems that exist in contemporary society. Multi-disciplinary teams, frequently cooperate with outside professionals, who act as mentors. Superior analytical abilities and thorough grounding in disciplinary fundamentals and design enable students to collaborate on these projects. Results may be published, presented at conferences or even patented.

A strong background in design threads throughout the curriculum, starting with the first year. These design experiences take into consideration factors such as environmental issues, sustainability, economics, teamwork, societal impact, safety and political climate—showing students that a “design” is much more than a purely technological solution.

Some design problems are offered in collaboration with foreign universities to increase awareness of the global nature of the engineering profession (e.g., The Cooper Union's study abroad and international exchange programs). Others may involve collaboration with industry, hospitals and/or other US universities.

Diverse electives are offered so that students can add a background in business and finance, additional mathematics and sciences or a “concentration” in an additional area of study.

Like The Cooper Union's other schools, the Albert Nerken School of Engineering is intimately involved with the New York metropolitan area. Sometimes, the city and its infrastructure are used as a laboratory. The school also draws on the region's abundant talent and resources, including an outstanding array of engineers and scientists employed at major corporations, governmental agencies and consulting firms in the New York region. The school calls on physicians, lawyers and other specialists to collaborate on research and mentoring and to give unique insights into

contemporary problems and social issues confronting modern engineers. Many of these professionals are alumni and may serve as adjunct faculty members lending a dynamism to the classroom.

Students benefit from an uncommonly close interaction with dedicated faculty, some of whom are alumni, in a conservatory style environment. Our faculty bring their diverse experiences to the classroom and laboratory setting and serve as role models to our students. See the work that our faculty and students have produced. Our students are encouraged to participate in The Cooper Union's rich seminar and cultural programs as well as to attend talks by guest speakers. They join various professional societies, many of which have chapters at The Cooper Union. Students are inspired to qualify for membership in national engineering honor societies. They also participate in student government and sports, and take advantage of the vast cultural environment offered by New York City and the neighborhood.

The School of Engineering strongly encourages undergraduate research activities and permits juniors and seniors to register for graduate level courses, when deemed appropriate. This enrollment does not guarantee admission to the master's program however. A Cooper Union undergraduate may declare the intent to complete an integrated degree in the second semester of the junior year or apply to the graduate program in one of the degree-granting departments during the second semester of the senior year.

Graduates of The Cooper Union are recruited by major national and international corporations, consulting companies, new ventures and graduate schools nationwide. Alumni are found in the top management and research leadership of many American corporations; hold key positions in federal, state and city agencies; and distinguish themselves on university faculties and administrations nationwide. Through their many and varied professional accomplishments, alumni have earned for the school its reputation for excellence.

Program Requirements

The specific programs for entering students are shown in detail for each department. From time to time, changes are made to these programs following curricular developments authorized by the faculty. Advances in technology and new technologies are closely monitored and are reflected by adjustments in all the engineering programs. Changes in engineering programs reflect advances in science and technology as well as advances in pedagogical techniques and developing industrial, graduate school and societal needs and expectations.

ACADEMIC STANDARDS AND REGULATIONS

Academic Integrity

Faculty at Cooper Union are committed to preserving an environment that challenges every student to realize his or her potential. You are expected to provide your best effort and will be supported to produce original work of the highest caliber.

Plagiarism is the presentation of another person's "work product" (ideas, words, equations, computer code, graphics, lab data, etc.) as one's own. Whether done intentionally or unintentionally, plagiarism is not tolerated in the School of Engineering.

There are many types of plagiarism, some of which are listed below. (The list is not exhaustive. Speak with the appropriate faculty member or dean or associate dean of engineering if you are uncertain as to what constitutes ethical conduct in a particular situation.)

You are plagiarizing if:

- You present as your own work product a homework assignment, a take-home exam or a class project that includes the efforts of other individuals. The contributions of other individuals (if permitted by your instructor) must be acknowledged in writing on the submitted assignment, exam or project.
- You copy the work of other students on an in-class examination or communicate with other individuals in any fashion during an exam.
- You submit as part of a homework assignment, take-home exam or class project material that has been copied from any source (including, but not limited to, a reference book, periodical, the Internet) without properly citing the source, and/or without using quotation marks. It is also prohibited to submit such materials in a minimally altered form without proper attribution. Improperly copied material might include text, graphics (computer or otherwise), computer source code, etc.

Other prohibited acts of academic dishonesty include (but are not limited to):

- Attempting to obtain a copy of an examination before it is administered.
- Dishonesty in dealing with a faculty member or a dean, such as misrepresenting the statements of another faculty member.
- Bringing notes into an examination when forbidden to do so.
- Bringing any device into an examination (computer/ smartphone/ calculator), which permits the retrieval of examination-related materials unless expressly permitted by the instructor.

- Bringing any device into an examination that allows communication with other individuals or computers or computer databases unless expressly permitted by the instructor.
- Using a generative AI (e.g. ChatGPT) when not explicitly authorized by the instructor.

MASTER'S DEGREE REQUIREMENTS

Masters Program—Civil Engineering

Non-Thesis Requirements

The 30 credits offered for the non-thesis program degree must satisfy the following distribution along with a special project requirement::

- Major: Complete a minimum of 18 credits of graduate level courses in one of the two specialized areas
- Non-thesis projects should produce an individual report in a civil engineering graduate course within the same specialized areas. The report must include substantial design and research, and take at least 6 weeks to complete.
- Complete a minimum of 12 further credits of graduate level courses
- Please refer to [this document](#) for detailed guidelines and formatting instructions for the non-thesis project report.

More details can be found [here](#).

COURSES

CHEMICAL ENGINEERING

ChE 210 **Materials Science for Chemical Engineers**

An introduction to the basic principles underlying the behavior of materials. The course provides the scientific foundation for an understanding of the relationships among material properties, microstructure, and the behavior of metals, ceramics, and polymers. Students will develop a vocabulary for the description of materials and explore how atomistic properties influence larger scale morphology and macroscopic behavior. Additionally, students will participate in hands-on experiments, analyzing how the design and fabrication of a material affects its macroscopic behavior.

Prerequisite: Ch 110. 4 credits.

ChE 233 **Chemical Engineering Thermodynamics**

Application of the first and second laws of thermodynamics to batch and flow processes for single component systems. Topics include energy and entropy balances, fundamental property relationships, applications of steam tables, fugacity, residuals, chemical reaction and liquid-vapor equilibria, and choosing appropriate thermodynamic models. *Prerequisites: Ch 161 and ChE 221. 4 credits.*

ChE 311 **Safety, Health, and Loss Prevention in Manufacturing**

Introduction to process safety. Case studies and important incidents that process safety could have prevented and how they inform the modern practice of engineering. Characterizing hazards associated with manufacturing, including toxicity, flammability, reactivity, mechanical, electrical, etc. Inherently safe design and examples. Control and mitigation systems for preventing incidents, including plant procedures. Major regulations that impact safety, particularly in chemical plants. Consequences of acute and chronic releases and exposures. Hazard identification, evaluation, and risk assessment, especially new risks or hazards due to climate change.

Prerequisites: ChE 232 or ESC 330. 3 credits.

ChE 332 **Chemical Reaction Engineering**

This course focuses on modeling batch, semi-batch, continuously stirred tank reactors (CSTR), plug flow reactors (PFR) and packed bed reactors. Initially, isothermal, isobaric, single reaction systems are studied and the basics of kinetics are covered. The second portion of the class focuses on topics including heat effects, catalytic reactors, pressure drop through packed beds, biological systems, micro-reactors, and membrane reactors. *Prerequisites: ChE 221, and either Ch 160 or Ch 161. 3 credits.*

ChE 342 Heat and Mass Transfer

In this course, we will build upon our knowledge of fluid mechanics and thermodynamics to learn the principles of heat and mass transfer. Although the principles of heat and mass transfer have widespread usage in the chemical process industry, these principles are also applied in food science, pharmaceutical, and other industries. First, we will begin by learning the three principle modes and mechanisms of heat transfer. After developing a strong understanding of how heat and energy are transported, we will consider mass transfer as an analogous transport process by which matter is transported by diffusion. We will then consider how both energy and mass are transported by convective motion and apply the analogies and relationships between convective momentum, heat, and mass transfer. Throughout the course, we will use multiphysics simulation software to help us enhance our transport phenomena learning experience. Lastly, we will apply all of these principles to the design of heat transfer equipment, particularly heat exchangers. To accomplish this, we will learn process simulation software to aid us in heat exchanger design. *Prerequisites: Ma 240, ChE 221, ChE 232, and ChE 341. 4 credits.*

ChE 352 Process Simulation and Mathematical Techniques for Chemical Engineers

Using practical numerical methods and computer software, you will solve chemical engineering problems in mass and energy balances, thermodynamics, fluid flow, heat transfer, separations, and chemical reactor analysis. In the process you will learn about algorithm performance, error analysis, and debugging. This course will not evaluate you very much on translating physical situations to appropriate models; this is a course on handling the models themselves. In this course, you will encounter the types of chemical engineering problems familiar from your previous coursework, but now at a more realistic complexity and scale. *Prerequisites: ChE 341 and Ma 240. 3 credits.*

ChE 372 Chemical Engineering Laboratory II

This second laboratory course emphasizes the application of engineering fundamentals to real manufacturing processes and unit operations. The experiments cover traditional engineering applications, primarily in separation processes, as well as newer technologies that students may encounter in industry. The course is designed to provide hands-on experience which complements theories and principles discussed in chemical engineering courses. The course will require application of statistics and design of experiments. Preparation of detailed lab reports, posters, oral presentations, and other technical communications are important components of the course. *Prerequisite: ChE 371. 2 credits.*

ChE 418 Carbon Removal Technologies

Survey of the field of Carbon Dioxide Removal (CDR) technologies. Review of models that estimate carbon removal amounts to meet international climate goals. Basics of existing adsorption technology and design of industrial CDR plants. Evaluation of biomass-based CDR solutions: afforestation, biochar, and Bioenergy with Carbon Capture and Storage (BECCS). *Prerequisites: ChE232 or ESC-330 (Thermodynamics I). 3 credits.*

ChE 382 Process Evaluation and Chemical Systems Design II

This is a continuation of ChE 381 and is the “capstone design course” in chemical engineering. All aspects of chemical engineering are integrated into the design of a chemical process plant. The design process consists of flowsheet development, equipment selection and sizing, utility requirements, instrumentation and control, economic analysis, and formulation of safety procedures. A plant design is carried out in class and the course includes the use of professional simulation packages such as Aspen Plus. AIChE National Student Design Competition projects are often included in this course. *Prerequisite: ChE 381. 4 credits.*

ChE 444 Computational Modeling of Materials and Molecules (Starting Spring 2025)

Project-based course on modern practices of molecular simulation in the context of engineering systems. The history of computer and molecular simulations, physical and mathematical modeling of molecules, development of molecular simulations, best practices in scientific computing in the context of modeling molecular systems, contemporary open-source simulation packages for molecular dynamics and Monte Carlo methods, analysis and measurement of simulation data, effective visualization of computer simulations, applications relevant to material property prediction in engineering contexts, and recent developments in molecular simulation methods. *Same as EID 444. Prerequisites: CS 102 or ECE 160 and Ch 160 or Ch161 or ESC 330. 3 credits.*

ChE 474 Drug Formulation and Delivery

The fundamentals of drug formulation and drug delivery systems in the context of current therapeutics on the market. Specific topics include traditional drug formulation, mechanisms and kinetics of pharmaceutical stability, controlled-release devices, transdermal delivery, intravenous delivery, oral drug delivery, pulmonary delivery, targeted drug delivery, and gene therapy. The course is designed to cover specific drug delivery topics that are expanded upon with student driven discussions of primary literature assigned by the professor. *Prerequisites: Ch 231 or permission of instructor. 3 credits.*

CIVIL ENGINEERING

CE 151 **Urban Transportation Planning**

Historical background and evolution of current procedures used in the urban transportation planning process. Covered are the historical framework, urban development theories, land use, trip generation, trip distribution models, traffic assignment techniques, modal split and introduction to urban transportation systems. *Prerequisite: none. 3 credits.*

CE 220 **Civil Engineering Fundamentals**

Planning, execution and interpretation of drawings and specifications for civil engineering projects. Sample drawings and specifications. Contractual requirements. Sample contracts. Permitting, scheduling and cost estimation. Basic operations of design and construction firms. Interface with other disciplines on civil engineering projects. *Prerequisite: EID 101. 3 credits.*

CE 322 **Structural Engineering II**

Modern methods of structural analysis of indeterminate structures. Discussion of energy methods, force methods and displacement methods. Formulation of elementary matrix stiffness and flexibility methods. Computer applications in structural analysis. *Prerequisite: CE 321. 3 credits.*

CE 331 **Introduction to Geotechnical Engineering**

Introduction to various indexing tests of soils, clay mineralogy, permeability, seepage and flow nets, stress distribution in soil masses, one dimensional consolidation theory, strength characteristics of soils, application of Mohr's Circle to soil mechanics, stability of slopes.

Prerequisite: ESC 201, ESC 340. 4.5 credits (3 hours of lecture, 3 hours of laboratory).

CE 341 **Design of Steel Structures**

Study of behavior and design of structural steel components and their connections. Understanding and development of design requirements for safety and serviceability, as related to latest structural steel specifications by the American Institute of Steel Construction (A.I.S.C.). Current design emphasizing LRFD, fabrication and construction practices. Composite design. *Prerequisite: CE 321; corequisite: CE 322. 3 credits.*

CE 343 Water Resources Engineering (same as EID 343)

Problems in conservation and utilization of water. Hydrologic techniques. Surface water and ground water supplies. Water transmission and distribution. Flood control, navigation and irrigation. Introduction to open channel flow and pipe networks. Design of hydraulic structures. Experimental aspects of hydraulic phenomenon. Emphasis placed on basic experimental techniques, design of experiments, selection and use of appropriate instrumentation and interpretation of results. *Same as EID 343. Prerequisite: ESC 340; Same as EID 343. 4.5 credits (3 hours of lecture, 3 hours of laboratory).*

CE 348 Environmental and Sanitary Engineering (same as EID348)

Engineering (same as EID 348) Topics include types of environmental pollution and their effects; water quality standards and introduction to laboratory analyses of water quality parameters; sources and estimates of water and wastewater flows; physico-chemical unit treatment processes. Integrated lecture and design periods cover water supply network, wastewater collection system and water treatment design projects. *Prerequisites: CE/EID344. 3 credits.*

CE 361 Civil Engineering Experimental Projects

Exploratory experimental projects in materials, hydraulics, soils, environmental or other civil engineering specialties. Projects are conceived, designed and executed by groups of students under faculty supervision. *Prerequisite: permission of instructor. 2 credits.*

CE 364 Civil Engineering Design II

Continuation of CE 363. *Prerequisite: CE 363. 3 credits.*

CE 422 Finite Element Methods (same EID422)

Shape functions and generalized displacements. Assemblage of elements. Convergence criteria. Triangular, rectangular and quadrilateral elements in plane stress and plane strain. Isoparametric formulations. General solids. Hexahedral and tetrahedral elements. Flexure in plates. General shells. Natural coordinates. Computer programs. *Same as EID 422. Prerequisite: CE 322 or ME 300. 3 credits.*

CE 435 Special Topics in Geotechnical Engineering I

Analysis of slopes using translatory slides and available software packages (PCSTABL). Ground improvement technologies: including dynamic compaction, grouting, ground freezing and reinforced earth technologies. *Prerequisite: permission of instructor. 3 credits.*

CE 441 Water and Wastewater Technology

Wastewater sources and estimates of domestic, commercial and industrial flows. Integrated lecture and design periods that cover unit processes for water and wastewater treatment. Design projects include hydraulic and process design of oxidation ponds, screening, grit removal, sedimentation tanks, secondary biological treatment, other physicochemical processes and outfall design.

Prerequisite: permission of instructor. 3 credits.

CE 450 Civil Engineering Construction

Preparation of plans and specifications. The bidding and award process. Contractual relations between the owner and the contractor. Preparation of cost estimate for a competitively bid project. Preparation of a progress chart and critical path. Sequencing various job elements. Engineering the actual construction. Management of labor. Interlacing with the community. Environmental requirements. Job safety. Changes and unanticipated conditions. Contract disputes and their resolutions.

Prerequisite: CE 341. 3 credits.

CE 471 Engineering Risk Analysis

The main objective of this course is to introduce students to the basic terminology and tools related to probability theory, statistics, and decision theory in the context of solving civil engineering problems. A secondary objective is to expose students to the many uncertainties inherent in civil engineering and to the tools that are available for modeling and analyzing such uncertainties. Topics to be covered include probabilistic modeling, statistical inference, Bayesian statistics, and decision under uncertainty.

Prerequisites: MA 224 (Probability) or graduate standing.

CE 472 Mass Timber Design

Design of mass timber structures following the procedures in the National Design Specification (NDS) for Wood Construction. Strength and serviceability requirements for commonly used mass timber elements including cross laminated timber and glulam. Material behavior of timber compared to concrete and steel. Design of connections and detailing considerations for the practical implementation of mass timber designs. The course includes a design project where students will apply the design principles onto a multi-story mass timber building.

Prerequisite or co-requisite: CE341. 3 credits.

CE 473 Earthquake and Wind Engineering

Concepts of earthquake engineering and seismic resistant design. Earthquake ground motion. Dynamics of SDOF and MDOF. Lateral load resisting systems. Code provisions for seismic design. Seismic performance based design. Soil structure interaction. Concepts of wind engineering. Wind velocities and wind loads. Code provisions for wind loads. Wind loading on unique structures. Wind tunnel tests and result interpretation. *Prerequisite: CE425. 3 credits.*

CE 485 Green Sustainable Cities

Design and modeling of green streets green walls, green roofs, blue roofs, and green parking lots; concepts and practical considerations. Study of evapotranspiration, radiation, and drainage of vegetative systems. Sustainable management and reuse considerations of urban storm water; sustainable and positive environmental impact design concepts. Management and reuse/recycle considerations for urban gray water. Examples of international projects and case studies. Team design projects with class powerpoint presentations. *Prerequisite: permission of instructor. 3 credits.*

ELECTRICAL ENGINEERING**ECE 210 MATLAB Seminar: Signals & Systems**

A weekly hands-on, interactive seminar that introduces students to MATLAB, in general, and the Signal Processing Toolbox in particular. Students explore scientific computation and scientific visualization with MATLAB. Concepts of signal processing and system analysis that are presented in ECE 211 or other introductory courses on the subject are reinforced through a variety of demonstrations and exercises. It is strongly encouraged for students taking a first course in signals and systems, or for students expecting to use MATLAB in projects or courses.

Prerequisite: MA 113. Recommended co-requisite: ECE 211 or equivalent. No credits.

ECE 211 Signal Processing

This course presents a unified approach to signals and systems. Signal-space concepts for representation and approximation: inner product, orthogonal expansions, projection, Lp-norms, eigenanalysis, least-square problems, SVD. Phasors, complex baseband, line spectra. Sampling, aliasing and imaging. Analog and digital LTI systems in the time, frequency and transform domains: convolution, frequency response, transfer functions. Fourier, Laplace and z-transforms. FIR and IIR digital filters. Block diagrams, stability, feedback, initial conditions, transient modes, damping factor, Bode plots. Analog and digital state-space, transition and transfer function matrices. Random signals and vectors: correlation matrices, Gaussian vectors and signals, white noise, stationarity, ergodicity, power spectral density, ARMA models. Extensive use of MATLAB. *Prerequisite: Ma 113; corequisite or prerequisite: ECE 210. 3 credits.*

ECE 241 Electronics I

Semiconductor physics: band theory, carrier distributions and transport mechanisms. PN-junctions, PN junction devices. Diode circuits. BJTs and CMOS: current relationships, operating region. Biasing circuits, DC Analysis; small-signal models, AC analysis. BJT/CMOS amplifier configurations. Projects utilizing Virtuoso/Spectre industry standard tools. *Prerequisite: ECE 240. 3 credits.*

ECE 251 Computer Architecture

Computer abstractions, performance measures; number representations and ALU operations; accumulators, registers and stack-based design; instruction sets, addressing modes; data path and control, microprogramming; memory hierarchy; I/O, bus design and data transfer; interrupts. Focus on MIPS with extensions to ARM. Hardware descriptive language (HDL). Course work includes assembly programming and the design of a simulated processor using Verilog. *Prerequisite: ECE 150. 3 credits.*

ECE 302 Probability Models & Stochastic Processes

Topics in probability, random variables and stochastic processes applied to the fields of electrical and computer engineering. Probability, events, random variables, expectation, moments, characteristic functions, conditional probability and expectation. Functions of random variables, random vectors, Gaussian random vectors, Poisson points. Bounding and limit theorems. Relations among important distributions and probability models. Stochastic processes: stationarity, ergodicity, Brownian motion, Markov processes. Deterministic systems with stochastic inputs, correlation and power spectral density, ARMA models. Hilbert space and applications: orthogonality principle, discrete Wiener and Kalman filters, linear prediction, lattice filters.

Prerequisites: Ma 224 and ECE 300, or ECE 310 or permission of instructor. 3 credits.

ECE 303 Communication Networks

Analysis and design of communication networks. Network protocols, architecture, security, privacy, routing and congestion control, Internet, local area networks, wireless networks, multimedia services. Physical layer, multiple access techniques, transport layer. Introduction to probabilistic and stochastic analytic techniques for communication networks. *Prerequisites: ECE 150 and Ma 224. 3 credits.*

ECE 332 Electro-Mechanical Energy Conversion

Analysis of energy sources and energy converters. Principles of electro-mechanical energy conversion; singly and multiply excited systems; rotating and linear machines; three phase circuits; magnetic circuits and transformers; torque and induced voltage from field considerations; synchronous machines; induction motors; DC machines. Introduction to power electronics. Applications including high-speed transportation, energy storage and interconnection of distant generating stations.

Prerequisites: ESC 220 or ESC 221 or ECE 240, and Ph 213. 3 credits.

ECE 335 Engineering Electromagnetics

This course emphasizes time-varying fields, with topics presented from electrostatics and magnetostatics as necessary. Maxwell's equations, constitutive relations, phasor vector fields, wave and Helmholtz equations, potentials, boundary conditions.

Planewaves in lossless and lossy materials, polarization, incidence. Transmission lines: transient analysis, TDR, phasor analysis, standing wave diagrams, Smith chart, impedance matching. Guided waves: TEM, TE and TM modes, dispersion, evanescence, cavity resonators. Microwave network analysis and device characterization with scattering parameters. Antennas, antenna arrays and Fourier optics. Additional topics from microwaves and optics will be covered as time allows. Students use a vector network analyzer to perform measurements at high frequencies.

Prerequisites: Ma 223, Ph 213, ECE 240 and ECE 211. 4 credits.

ECE 345 Integrated Circuit Engineering

Feedback theory, frequency compensation. Integrated circuit fabrication and technology. Device modeling, thermal effects. VLSI CAD design tools. Circuit layout, extraction and simulation. Design and analysis of multistage MOS operational amplifiers, OTA architectures. Nonlinear circuits, comparators. Analog switches. Digital phase-locked loops. Sample and hold circuits. Data converter architectures. Switched capacitor circuits. Bandgap reference circuits. MOST digital circuit design and layout, hierarchical approaches. Final design project is a mixed analog/digital circuit (e.g., Flash A/D converter, phase-locked loop), which is sent for fabrication. *Prerequisites: ECE 342. 3 credits.*

ECE 366 Software Engineering & Large Systems Design

This course teaches about the development stages of large, robust, expandable software systems developed as part of a team. Topics include project management, capturing requirements, system design, UML, program design, testing, delivery and maintenance. The class will develop a large project as a team using Java throughout the semester. Tools, libraries and techniques necessary for the project will be covered in class, e.g., Eclipse, Javadoc, XML, SOAP, servlets, threads and processes, Swing, JUnit, MySQL, JDBC, etc. The specific resources might change from semester to semester. *Prerequisite: ECE 365. 3 credits.*

ECE 394 Junior Electrical Engineering Projects II

Principles learned in ECE 393 are applied to the design, construction and characterization of electrical and computer engineering projects of significant complexity. Assignments typically involve both analog and digital design, and students are free to pursue any solution that satisfies the engineering requirements and meets with the instructor's approval. Formal and informal lectures are given on safety, circuit operation and design, and construction techniques; participation in design reviews and technical reports. *Prerequisite: ECE 393. 3 credits.*

ECE 396 Senior Electrical Engineering Projects II

This course concludes the senior project begun in ECE 395. Students submit two complete theses, one in short form and the other in long form, and give at least two presentations, one short and one long. The initial goal is to achieve a functioning system. Afterwards, students undertake the completion of the prototyping cycle, which may involve improving the circuit implementation (such as by employing PCBs populated with surface mount chips), adding a user-friendly interface, obtaining precise performance evaluations, or developing demonstrations and a user's manual. Advanced students are strongly encouraged to complete their project early and commence a master's thesis. *Prerequisite: ECE 395. 3 credits.*

ECE 413 Music & Engineering

Spectral representation and analysis of music. Analog and digital music signals, instruments and synthesizers, analog circuits and digital processing. Description of musical quality and perception, introduction to acoustics, stereo and special effects. Computer interfacing with MIDI and laboratory experiments.

Prerequisites: ECE 211 and ECE 150. 3 credits.

ECE 414 Machine Learning

Application of remotely sensed geospatial datasets to analyze physical processes on earth. Geospatial data and Geographic Information Systems (GIS) data; projections, coordinate reference systems, cartography. Satellite imagery datasets across the frequency spectrum, including optical, infrared, thermal and radar. Google Earth Engine, GDAL and QGIS. Applying remote sensing, image processing and machine learning algorithms to geospatial data. *Prerequisites: Ma 223 or Ma 225, Ma 224 or Ma 226; either ECE 211, ChE 352 or ME 351, Must be completed prior to taking this course. 3 credits.*

ECE 435 Medical Imaging

A survey of modern techniques for medical imaging relevant in clinical and research settings, and associated techniques of image processing. Review of optics; classical microscopy; CT; fluorescence and 2-photon microscopy; interferometry; phase microscopy; ultrasound, CAT and OCT; MRI and f-MRI. Introduction to wavelet theory and sparse coding. Limits and noise sensitivity of various modalities (e.g., speckle noise in OCT, diffraction limit in classical microscopy, phase noise in interferometry); denoising and contrast enhancement. Feature extraction from medical images and 3D stacks. *Prerequisite: ECE 211. Recommended prerequisite: ECE 310. 3 credits.*

ECE 442 Communication Electronics

Circuit design for advanced communications applications. Design of high-frequency amplifiers, oscillators and mixers using large signal analysis. Effects of noise and non-linearities are examined from the diode and transistor level to board level. Communication subsystems of interest include phase locked loops, modulators and demodulators (AM, PM FM), and signal processors for multiple access systems (TDMA, FDMA, CDMA). Course work includes computer-aided simulation and design projects. *Prerequisites: ECE 300 and ECE 342. Corequisite: ECE 335. 3 credits.*

ECE 444 Bio-instrumentation and Sensing

The basic human vital signs and some related elementary physiology viewed from an engineering standpoint with special emphasis placed upon current electronic measurement methods. Electrocardiographic and electromyographic signals. Safety problems related to electrical isolation. Guarded, fully isolated, modulated carrier operational amplifiers and microvolt-level amplification. Solid-state “grain of wheat” pressure sensors, microelectrodes, thermal probes, ultrasonic transducers and other biosignal sensors. Course work includes instrumentation and sensing projects. *Prerequisites: ECE 211 and ECE 342. 3 credits.*

ECE 464 Databases

Engineering and design of databases. Topics to be covered may include: data models, database and scheme design; schema normalization and integrity constraints; query processing and optimization; distributed and parallel databases; SQL and XML. *Prerequisite: ECE 365. 3 credits.*

ECE 476 Data Science for Social Good

Applications of machine learning, data science and software engineering to projects in the areas of education, equality, justice, health, public safety, economic development or other areas. Projects will be done in collaboration with external partners, and will be focused on solving problems with an emphasis on the greater New York City Area. Students will work with external partners to specify problems and investigate possible solutions. Students will work between disciplines to develop new machine learning based solutions. Additionally, students will work collaboratively to visually convey the insights and results generated.

Prerequisite: Complete either ECE 467 or ECE 469 or ECE 471 or ECE 472 or ECE 474 or ECE 475. Permission of instructor required. Must be completed prior to taking this course. 3 credits.

MECHANICAL ENGINEERING

ME 103 **Statics**

This foundation course develops a sound problem-solving methodology based on engineering applications involving forces acting on non-accelerating structures. Topics include equivalent system of forces; equilibrium; moments and couples; centroids and distributed forces; forces in structures (trusses, frames, machines); friction forces. *Corequisite: ME 104. 2 credits.*

ME 104 **Measurements Laboratory**

The course, taken concurrently with Statics, includes laboratory modules that focus on the measurement of force from both mechanical and electrical signals. Students develop laboratory and technical communication skills. *Corequisite: ME 103. 1 credit.*

ME 211 **Design and Prototyping**

A mechanical engineering hands-on workshop geared towards the understanding and practice of basic engineering design and fabrication tools. Topics include hand tools, simple machining, mold making, casting, materials, fasteners, adhesives, and finishes. 3-D digitizing, solid modeling, rapid prototyping and computer interfacing will also be presented. Team projects will familiarize the students with typical tools and processes employed in realizing a design concept, from sketch to functional prototype. Each student will participate in and contribute to the team-learning and creation process. *Prerequisites: EID 101. This course is open to art and architecture students with a prerequisite waiver. Open to all students. 2 credits.*

ME 301 **Mechanical Vibrations**

Mechanical systems with single and multiple degrees of freedom longitudinal, torsional and lateral vibrations; free and forced oscillations; vibration testing, dynamic stability, vibration isolation, design criteria. Computer-aided design assignments and vibration project. *Prerequisites: ME 200 and Ma 240. 3 credits.*

ME 311 **Mechanical Design**

Mechanical design of basic transmission elements; design optimization by blending fundamental principles and engineering judgment; design criteria for the various frictional machine elements. Design projects provide authentic involvement in problems from industry; design projects make use of computer, experimental and modeling techniques. *Prerequisite: ME 310. 3 credits.*

ME 342 Heat Transfer: Fundamentals and Design Applications

One-dimensional steady-state conduction. Two-dimensional steady state conduction and transient conduction: finite-difference equations and computational solution methods. Convection; introduction to laminar and turbulent viscous flows; external and internal forced convection problems, including exact and numerical solution techniques; free convection. Introduction to radiation heat transfer and multimode problems. Open-ended design projects will include application to fins, heat exchangers, tube banks and radiation enclosures and will make use of computer-aided design techniques. *Prerequisite: ESC 340. 3 credits.*

ME 353 Mechatronics (Same as EID353)

Topics include computer architecture, PIC processor overview, dynamic modeling, sensors, data acquisition, digital PID control theory, and utilization of assembly language to code the controller. Students will design, build and test a controller board and present a final prototype of a control system. Engineering economics will be introduced and integrated into the final project.

Same as EID 353. Prerequisite: ME 351 or ECE 211 (Signals) or ChE 361. Open to all students. 3 credits.

ME 360 Engineering Experimentation

Election, calibration and use of subsystems for the measurement of mechanical, thermal/fluid and electrical phenomena. Laboratory work includes investigations of heat exchangers, fluid systems and internal combustion engines. Emphasis is placed on data collection and statistical reduction, computational methods and written and oral presentation skills. *Prerequisites: ESC201 and ESC330. 3 credits.*

ME 394 Capstone Senior ME Design

The application of open-ended design work to the synthesis of engineering devices and systems for the satisfaction of a specified need. Consideration of market requirements, production costs, safety and esthetics. Projects are carried out in small groups and are supervised by the instructor in accordance with professional practice. The goal of the course is to create a working design, clearly defined in drawings and specifications. *Prerequisite: ME 393. 3 credits.*

ME 407 Introduction to Computational Fluid Dynamics

The need for and applications of computational fluid dynamics (CFD). Introduction to CFD analysis and commercially available codes. Governing equations and numerical solution methodologies for basic fluid flow systems. Geometric modeling and grid generation. Examination of various physical models. Use of a commercial CFD code. *Prerequisite: ESC 340 or ChE 341. 3 credits.*

ME 413 Advanced Product Development

Developing a physical product for the market is a complicated and exciting process that requires expertise in design, engineering, business, and marketing. As part of this course, students will choose and research a market segment, create an innovation for that market, and develop that innovation into a manufacturable product. Along the way they will constantly test and validate their product's functionality and marketability. Ultimately the students will develop a functional prototype and product launch strategy, which will include a brand identity, marketing campaign and a viable product channel. At the end of the semester students will present a physical prototype and comprehensive product display as part of the end of the year show and develop a portfolio of their product development process.

Prerequisites: ME 211 or Instructor's Permission. 3 credits.

ME 452 Heating, Ventilation, and Air Conditioning

The course will develop and apply the general methods used in HVAC calculations, including heating, air conditioning and refrigeration. The basic HVAC equipment and processes include piping, fittings, valves, pumps, fans, heat exchangers, mass exchangers, heat pumps, process variables monitoring and control, multi-node flow and energy networks, and these will be examined and modeled. This will involve the theory and results from thermodynamics, fluid dynamics, heat transfer and mass transfer (and transport phenomena and boundary layer theory), process control, and computer simulation. In addition to the general HVAC calculations, more advanced analysis methods will be developed. *Prerequisites: ESC 330 and ESC 340. 3 credits.*

ME 459 Bio-Inspired Robotics

This course introduces students to the field of biologically-inspired robotics. Principles of various types of locomotion, such as legged walking/running, flap-ping-wing flight, and jumping, in both biology and robotic systems are introduced. Additional topics include principles of scaling, soft robotics and soft materials, bio-inspired sensing, and control algorithms (such as swarm behavior). The course will include reading research papers, implementing numerical simulations of dynamic behavior, and physical implementation of topics. Students will complete a design project of their choosing, culminating in a final demonstration.

Prerequisite: ME 351 or ECE 211 or ChE 352. ME353/EID353 recommended, but not required. 3 credits.

ENGINEERING SCIENCES

ESC 201 **Mechanics of Materials**

Introduction to solid mechanics; analysis of stress and deformation. Extension; flexure; torsion. Axisymmetric problems, beam theory elastic stability, yield and failure theory. *Prerequisite: ESC 200 or ME 200. 3 credits.*

ESC 221 **Basic Principles of Electrical Engineering**

Selection of topics from ESC 220. This class meets with ESC 220 for the first ten (10) weeks. *Prerequisite: Ma 113. 2 credits.*

ESC 251 **Systems Engineering**

An introductory course to the mathematical modeling of systems. Topics include mechanical elements and systems, electric circuits and analogous systems, fluid elements and systems, analysis of systems using transfer functions, state space equations, analog simulation and digital simulation. Also covered are block diagrams, Laplace transforms, and linear system analysis. Computer projects will be assigned that will use MATLAB software.

Requisite: MA 240 (Must be completed prior to taking this course.). 3 credits.

INTERDISCIPLINARY ENGINEERING

EID 220 **Foundations of Bioengineering**

An introduction to the engineering study of biological systems. Basic physiochemical and organization principles applicable to biological systems. Topics include membrane structure and function, physiology of the nervous, circulatory, and respiratory systems, and an introduction to bioelectricity and biological transport phenomena.

Prerequisite: Ch 110. 3 credits.

EID 234 **Environmental Technologies for the Built Environment: Materials and Systems**

This interdisciplinary course engages students in lectures, discussions, case studies, and workshops in two modules that explore matter, materials and making, and systems for high performance buildings, culminating in a project after each module. This course covers environmental and life safety systems as they affect program and building form, including mechanical (heating, cooling, ventilating), water supply and disposal, electrical, lighting, vertical transportation, communication, security, and fire protection. Principles of sustainability and life cycle analysis.

Prerequisites: EID233 or ESC330 or ChE232. 3 credits.

EID 247 Introduction to Sustainability and Alternative Energy Technologies

Sustainability and sustainable development and how they relate to culture, politics, and design of our built environment. Review of the technological history of fossil fuel use and how it has affected Earth's climate. Global warming potential, radiative forcing, carbon cycle, and carbon budget. Life Cycle Assessment (LCA) and its application to sustainability / minimizing environmental impact. Alternatives to fossil fuel energy (including nuclear, geothermal, solar, hydropower, and bioenergy sources) and potential consequences of these technologies. *3 credits.*

EID 364 Interdisciplinary Engineering Research Problem

An elective course, available to qualified upper division students. Students may approach a faculty mentor and apply to carry out independent or group projects in interdisciplinary fields. Prerequisite: permission of advisor and appropriate Department Chair. *3 credits.*

EID 367 Elements of Innovation

This course begins by developing an understanding of disruptive innovation and the historical context about successes and failures of social, cultural, and religious acceptance of technological innovation. To develop this framework, students read several texts underlying the innovator's dilemma, how scientific revolutions are structured, and cultural distinctions found between the sciences and humanities. For each class meeting, students read current scientific and technical literature and come prepared to discuss current events related to technological innovation. Each student researches potential disruptive technologies and prepares a compelling argument of why the specific technologies are disruptive so they can defend their choice and rationale. In addition to technological innovation, students will investigate organizational culture and structure and how these enable an innovation ecosystem at the corporate, regional, and global levels. Students will interact with national level innovators throughout academia, industry, and government. Coursework includes extensive writing assignments. *3 credits.*

EID 370 Engineering Management

An exploration of the theories and techniques of management beginning with the classical models of management and continuing through to Japanese and American contemporary models. The course is specifically directed to those circumstances and techniques appropriate to the management of engineering. Lecture, discussion and case studies will be used. *Prerequisite: permission of instructor. 3 credits.*

EID 444 Computational Modeling of Materials and Molecules (same as ChE444)

Project-based course on modern practices of molecular simulation in the context of engineering systems. The history of computer and molecular simulations, physical and mathematical modeling of molecules, development of molecular simulations, best practices in scientific computing in the context of modeling molecular systems, contemporary open-source simulation packages for molecular dynamics and Monte Carlo methods, analysis and measurement of simulation data, effective visualization of computer simulations, applications relevant to material property prediction in engineering contexts, and recent developments in molecular simulation methods.

Same as ChE 444. Prerequisites: CS 102 or ECE 160 and Ch 160 or Ch161 or ESC 330. 3 credits.

BIOLOGY

Bio 202 Biology for Engineers II

This course will provide human biology fundamentals to springboard into research projects at the intersection of biology and engineering. Topics will include anatomy and physiology of musculoskeletal and other major organ systems not covered in Bio 101, imaging modalities, concepts behind diagnostic and therapeutic surgical procedures, and their limitations, human body repair, artificial organs, tissue engineering, immunology and cancer. Students will develop an extensive biological vocabulary and have requisite knowledge for further study in biomechanics, rehabilitation medicine, biomaterials, bioremediation, etc. *Prerequisite: Ch 110. Open to all students. 3 credits.*

Bio 250 Biotechnology in Environmental Systems

Application of biotechnology to environmental challenges; microbiology; ecology; microplate reader assays; biomaterials; genetic modification of microbes, bioremediation, biosafety biomimicry. *Prerequisite: None 3 credits.*

CHEMISTRY

Ch 161 Physical Principles of Chemistry

The study of physicochemical properties will be extended and advanced. The laws of thermodynamics, which involve energy, enthalpy, entropy and free energy concepts, will be applied to chemical systems. Other topics include: vapor pressures and colligative properties of solutions; the phase rule; kinetics of homogeneous reactions; reaction mechanisms and homogeneous catalysis; and electrolytic conductance and electrochemistry, with applications to the design of batteries, fuel cells and sensors. *Prerequisites: Ch 110, Ma 111. 4 credits.*

Ch 232 Organic Chemistry II

Extension of Ch 231 to systematic study of aliphatic and aromatic compounds, with emphasis on functional behavior and interpretation of mechanisms and bond types, polyfunctional compounds, carbohydrates and heterocyclic compounds.

Prerequisite: Ch 231; co-requisite: Ch 233. 3 credits (2 lecture hours).

Ch 233 Organic Chemistry Laboratory

Laboratory work will cover subject matter studied in Ch 231 and Ch 232, including synthesis and type reactions and identification of organic compounds.

Prerequisite: Ch 231. 2 credits (4 laboratory hours).

Ch 340 Biochemistry

This course in the fundamentals of biochemistry will cover the following: Chemistry of carbohydrates, lipids, amino acids, proteins, and nucleotides; bioenergetics; kinetics and mechanisms of enzymes; and an introduction to molecular genetics, and biochemical dynamics of DNA and RNA. *Prerequisites: Bio 201 and Ch 231. 3 credits*

Ch 362 Physical Chemistry II

Continuation of Ch 261 with emphasis on electrochemistry, chemical kinetics and solid state chemistry. Selected topics. *Prerequisite: Ch 361. 2 credits.*

Ch 451 Nanomaterials (same as EID451)

Nanoscience is the study and manipulation of matter on an atomic and molecular level. At this scale, materials often exhibit new properties that do not exist in their large-scale counterparts because of the increased importance of surface area/volume ratios and quantum effects. This course will focus on understanding the physical properties and methodologies for the formation (i.e. molecular self-assembly, photolithographic patterning, scanning probe lithography), and characterization (i.e. optical spectroscopy, atomic force microscopy, scanning tunneling microscopy, and electron microscopy) of nanomaterials. *Same as EID 451. Prerequisites: Ch 110, Ch 111, and Ph 213, or permission of instructor. 3 credits.*

Ch 452 Electrochemistry

Electrochemistry allows the simultaneous recording of kinetic and thermodynamic information about a chemical reaction. This makes it a powerful tool in a wide variety studies. Since the reactions that define electrochemistry only occur within a few nanometers of the electrode's surface, mass transport coefficients and surface properties can be uncovered using electrochemical methods. The course will present the fundamentals electrochemistry, including electrical potentials, standard reduction potentials, batteries, reference electrodes, ion-selective electrodes, ionic mobilities, calculating junction potentials. Modern electrochemical methods, including cyclic voltammetry, electrogravimetry, ultra-microelectrodes and nanoelectrodes.

Prerequisites: Ch 231, Ch 351, and either Ch 362 or Ch 363. 3 credits

COMPUTER SCIENCE

CS 160 **Introduction to Procedural Programming**

This course introduces students to programming in C. The course covers fundamental programming constructs including variables, expressions, selection statements, loops, arrays, comments, functions, structures, pointers, strings, and dynamic memory allocation. The course emphasizes structured programming and top-down design. Additional topics include recursion, debugging, and an introduction to basic data structures and algorithms. Introduction to industry practices for team programming. *3 credits.*

CS 278 **Ethics of Computer Science**

A study of the political, ethical, and social dimensions of living in a world increasingly governed and defined by networked, computational systems, from their personal everyday impacts to their planetary ones. Drawing from a mix of historical and contemporary case studies, philosophy, and science fiction, students will explore frameworks for understanding technology not merely as artifact or product but as practice and ideology. As a final project, students will propose and prototype a framework for their own approach to ethical engineering and design. *3 credits.*

MATHEMATICS

Ma 345 **Functions of a Complex Variable**

Topological properties of complex plane, complex analytic functions, Cauchy-Riemann equations, line integrals, Cauchy's integral theorem and formula. Taylor series, uniform convergence, residues, analytic continuation, conformal mappings and applications. *Prerequisite: Ma 223. 3 credits.*

Ma 351 **Mathematical Analysis II**

Uniform convergence. Differentiation of transformations, inverse and implicit function theorems. Applications to geometry and analysis. *Prerequisite: Ma 350. 3 credits.*

Ma 352 **Discrete Mathematics**

Relations. Mathematical structures. Number theory. Algorithms. Complexity of algorithms. Cryptology. Recurrence relations. Graph theory. A shortest-path algorithm. Planar graphs. Trees. A maximal flow algorithm. Finite-state automata. Languages and grammar. Turing machines. The Church-Turing thesis. Unsolvable problems. *Prerequisite: Ma 110. 3 credits.*

Ma 402 Numerical Analysis

Techniques for the solutions of ordinary and partial differential equations, the classical problems of linear algebra, integration and systems of nonlinear equations. Error analysis, convergence and stability theory. Course assignments will include use of computing facilities. *Prerequisites: Ma 223 and Ma 240. 3 credits.*

PHYSICS

Ph 112 Physics I: Mechanics

Static equilibrium, kinematics, Newton's Law's, non-inertial frames of reference, system of particles, work and energy, linear and angular momentum, rigid body motion, conservation laws, oscillation.

Prerequisites: Ma 110 and Ma 111; Prerequisite and corequisite: Ma 113. 4 credits.

Ph 214 Physics III: Optics and Modern Physics

Geometric and physical optics, electrical and magnetic properties of matter. The quantum theory of light. The quantum theory of matter. Atomic structure.

Prerequisite: Ph 213 and Ma 223. 3 credits.

VIP

VIP38XF Chemical Engineering Competitions

This interdisciplinary VIP will focus on entering the American Institute of Chemical Engineers (AIChE) annual competition problems or regionally related Chemical Engineering Competitions, for instance, to use chemistry to power a small car (Chem-E-Car) or to build cube to extract carbon dioxide from the air (ChemE Cube). Students will work in teams to address the annual problem statement for the competition: identifying possible design solutions and building and testing their designs. Students will be required to communicate their process and product through poster presentations, addressing important issues related to safety and obtaining the proper training, and the environment.

VIP38XF is a multidisciplinary course supporting student and/or faculty-initiated projects, guided by faculty mentorship and professional research. Undergraduate students joining VIP teams earn one credit each semester for their participation in design/discovery efforts that enable them to explore their interests through long term projects. The teams are:

- Multidisciplinary—drawing students from all disciplines on campus;
- Vertically-integrated—maintaining a mix of freshmen through senior students;
- Long-term—each undergraduate student may participate in a project for up to three years.

Credits: 1

FACULTY OF THE HUMANITIES AND SOCIAL SCIENCES

HSS Course Objectives

HSS-4: The Modern Context: Figures and Topics

HSS-4 introduces students to the process of writing and research in the humanities and social sciences by focusing on a critical figure or topic from the modern period for the duration of the semester, cultivating depth of understanding rather than breadth of knowledge. Toward this end, the course develops the skills that students need to:

- Produce a substantial research essay with an original argument
- Marshal a variety of secondary sources (e.g., books, journal articles, images, Internet resources, interviews) in support of the argument
- Present research findings in oral form
- Engage in collaborative research activities (e.g., peer review, group projects)
- Master the conventions of citing both primary and secondary sources

Please note that HSS-4 may not be retaken for elective credit.

CURRICULUM

HSS-4: The Modern Context: Figures and Topics A study of an important figure or topic from the modern period whose influence extends into contemporary culture. The figures and subjects are chosen from a broad range of disciplines (including literature, history, politics, technology and art history, among others). Through concentration on a single figure or focused topic students are encouraged to develop a deep awareness of works of great significance and to understand them in the context of modernity. Guided independent writing projects and oral presentations give students an appreciation for what constitutes research in the humanities and social sciences.

Please note that HSS-4 may not be retaken for elective credit.

HUMANITIES AND SOCIAL SCIENCES MINOR

Academic Regulations

Transfer Credit

Transfer students may be placed out of some courses based on their previous undergraduate work undertaken at a degree-granting college or university. Credit for HSS courses will be awarded only when the course taken elsewhere is similar in form and content to the course given at Cooper Union, and when the grade received in that course is a B or higher. AP credits, “dual enrollment” credits, credits for courses without letter grades, and credits from non-academic courses are not accepted for transfer. Similarly, courses taught online, whether synchronously or asynchronously, are not accepted for transfer regardless of the institution.

Any student interested in transferring credits must make an appointment with the HSS Academic Advisor who will review the syllabus of the completed course and a copy of one completed assignment. Students must ensure that they have those documents ready when they come in for their appointment.

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Director of Academic Advising
and Off-Campus Programs
(January 12–May 20, 2026)

Janet Hill
Director of Academic Advising
and Off-Campus Programs
(effective June 8, 2026)

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Professor; Director of
Off-Campus Programs

Jose Ortiz
Director of the Saturday Program

Adjunct Faculty

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William Bevington
James Craig Designing with
Type Visiting Artist (Spring 2026)

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Brianna Harlan

Julie Harris

Cyrus Blaze Hodge

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Yasu Shibata

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Technical Assistant, Film/Video

Catherine Stack
Technical Assistant, Printmaking

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B.S. Tufts University,
Ph.D., Material Science
Harvard University

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Professor and Chair of
Computer Science;
John and Mary Manuck
Distinguished Professor
of Design Ph.D., Electrical
Engineering, Columbia
University, NY; M.S., B.S.,
Electrical Engineering,
Boston University

Mili Shah
Professor of Mathematics; Chair
of Mathematics Department;
Ph.D., Computational
and Applied Mathematics
Rice University

Adjunct Faculty

Yuval Philipson
Mechanical Engineering

THE COOPER UNION

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Kim Newman, media relations manager

Jared Parylo, director, facilities and capital projects (effective November 2025)

John Ruth, chief financial officer

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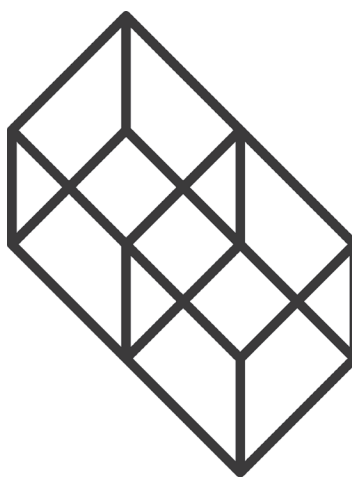
Barry Shoop, dean, Albert Nerken School of Engineering

Isaac Thweatt, vice president, alumni affairs and development

Antoinette Torres, vice president, institutional effectiveness

Mersiha Veledar, associate dean, The Irwin S. Chanin School of Architecture

Michael Young, dean, The Irwin S. Chanin School of Architecture (effective April 2026)



THE COOPER UNION