Albert Nerken
School of Engineering

ENGINEERING FOR THE
BENEFIT OF SOCIETY AND HUMANITY
The Albert Nerken School of Engineering is a small and prestigious program that consistently ranks within the top ten undergraduate engineering programs nationwide. It is the largest of the schools at The Cooper Union for the Advancement of Science and Art, with an enrollment of 450 undergraduate engineering students. Students attend The Cooper Union to discover, to innovate, and to apply their skills toward making a positive impact on their field and the world. The school has been central to New York City’s history and its political and social movements. In keeping with its founding mission to provide accessible and affordable education, the institution awards a 50% tuition scholarship to all admitted undergraduate students.

Some of the most brilliant and inventive minds of the last 160 years have been drawn to Cooper’s rigorous preparation in mathematics and natural sciences, as well as its emphasis on creative project-based learning and rich opportunities for research and advanced coursework. Our engineering graduates are known for revolutionizing their disciplines and transforming society, with achievements ranging from the Nobel Prize-winning discovery of a binary pulsar, to developing the first Global Positioning System, to engineering the infrastructures that support everyday life in New York City.

Faculty in the school of engineering are committed to preparing students to succeed in an increasingly complex world shaped by emerging technologies and global challenges. Experimentation and leading-edge pedagogies encourage students to collaborate at the intersections of art, architecture, engineering, humanities, and social sciences. Students can take advanced graduate level coursework, which further prepares them for competitive summer research and internship opportunities, as well as success in job placement and acceptance to top graduate programs.

The school of engineering is also committed to instilling a sense of social justice that translates into action, inspiring students to apply their expertise and leadership for the benefit of society and humanity. Outside of the classroom, students are involved in a wide range of extracurricular activities and have the chance to explore New York City as their extended campus.

Cooper at a Glance

• RANKED #1 BEST OVERALL UNDERGRADUATE SCHOOL IN ITS REGION (NORTH) IN 2020 BY U.S. NEWS & WORLD REPORT
• RANKED #10 IN THE NATION AMONG UNDERGRADUATE ENGINEERING COLLEGES IN 2020 BY U.S. NEWS & WORLD REPORT
• RANKED #8 IN 2018 TOP 25 STEM COLLEGES BY FORBES
• 8 TO 1 STUDENT-TO-FACULTY RATIO IN ENGINEERING
• 450 ENGINEERING STUDENTS WITH AN AVERAGE CLASS SIZE OF 22 STUDENTS
• 39 FULBRIGHT SCHOLARS SINCE 2001
• 13 NATIONAL SCIENCE FOUNDATION GRADUATE RESEARCH FELLOWSHIPS SINCE 2004
• 40 PERCENT OF GRADUATES PURSUE TOP-RANKED GRADUATE PROGRAMS
Undergraduate Majors

CHEMICAL ENGINEERING

From energy and the environment to nanotechnology and biomedicine, many important industries and professions require experts who can synthesize knowledge of physical and natural sciences, mathematics, and engineering. At The Cooper Union, Chemical Engineering majors acquire this foundational knowledge through hands-on training in the classroom, the lab, and the field and apply it to complex problems from the atomic and molecular level all the way up to technologies designed for the industrial scale. Recent graduates are working on groundbreaking research and new technologies in topics like sustainable energy and pollution prevention, 3D printing and manufacturing of pharmaceuticals, and the latest advances in materials science.

STUDENT SNAPSHOT

Michael Lange ‘20 has always loved chemistry, biology, applied science, and industrial processes. For its capstone senior project, his group researched how to design a processing plant that would turn a certain Asian grass into carbon monoxide and hydrogen, and from there into a carbon-neutral liquid biocrude usable as jet fuel. After a full technical analysis, they determined it can be done but don’t think it is economically feasible to do so, at least with their design. All that while taking a painting class at the School of Art. After graduating he will be working at Regeneron Pharmaceuticals, studying cell culture processes.
CIVIL ENGINEERING

Whether analyzing climate change resilience in New York City neighborhoods or researching sustainability through the green roof project at the Jacob K. Javits Convention Center, Cooper’s Civil Engineering students are at the forefront of addressing important societal issues and finding solutions to infrastructural challenges. The Civil Engineering department embraces a breadth of specialties, including structural, geotechnical, hydraulic, environmental, transportation, urban planning, and construction management, and exposes students to hands-on applications of cutting-edge technologies like augmented and virtual reality and 3D-printed structures.

With more than 90% of Civil Engineering seniors passing the Fundamentals of Engineering (FE) Exam, the first step towards obtaining the Professional Engineering License (PE), Cooper students work to build a smarter and more equitable environment for all.

STUDENT SNAPSHOT

QiTong Han’s ‘20 interest in civil engineering began when she had to translate documents for her father, who did sub-contracting work in New York City. During her senior year, she tested the use of recycled plastic as the coarse aggregate in concrete, and her senior design group worked on designing a waterfront park as an expansion of the Wall Street Ferry Terminal Pier 11. After receiving her bachelor’s degree, she will be continuing at Cooper for her Masters.
Aziza Almanakly '20 had a choice of engineering schools but attending a women-in-engineering night at the Albert Nerken School of Engineering sold her. For her senior project, "Development of Al-InAs Transistors for Scalable Quantum Computing," was completed in collaboration with a quantum materials and devices lab at New York University. Her group designed and fabricated transistors that, in extreme sub-zero temperatures, become quantum bits, or qubits. Next for Aziza: starting her PhD in Electrical Engineering and Computer Science at MIT.

ELECTRICAL ENGINEERING

Focusing on the devices and processes that form the backbone of modern technology, the Electrical Engineering program tightly integrates electronics, signal processing, and computer science. Recent student projects reflect a wide range of applications: sustainable engineering, medical imaging, drone control, quantitative finance, wireless communications, hardware implementation of neural networks, and beyond. Students can take advantage of the department’s laboratories and computing resources, including a GPU cluster that supports computationally intensive projects involving large data sets. One of the many opportunities for gaining practical experience is joining the “Microlab Staff,” a student group responsible for maintaining the department’s computing facilities. Projects in autonomous technologies reimagine societies and systems to make them more economically, environmentally, and socially sustainable. Projects in machine learning and data science allow students to solve real-world, data-oriented problems related to equity, justice, health, and economic development.
Creativity, problem-solving, and design are all at the heart of Cooper’s Mechanical Engineering program, which is the broadest of the engineering majors. Students have the flexibility to study a variety of theoretical and technological interests, including solid mechanics, materials, fluid mechanics, vibrations and acoustics, heat transfer and thermodynamics, combustion, control systems, manufacturing, CAD/CAM, and robotics. With access to research facilities like the Maurice Kanbar Center for Biomedical Engineering and the Material Science Lab, students work on projects ranging from brain wave-controlled drones to designing zero-energy homes. Mechanical Engineering is an ideal foundation for careers in the aerospace industry, ocean engineering, marine engineering, biomedicine, the automobile industry, the power and utility industries, and virtually anything that requires analytical abilities combined with a strong background in design practice.

**STUDENT SNAPSHOT**

Connor Lowry ‘20 likes working with his hands. The intimacy of Cooper Union appealed to him, as did the Formula SAE team which, unlike other schools with such teams, includes freshman and sophomores. His senior project in mechanical engineering involved finding ways to further cut the weight of the car. His team developed their own carbon fiber bulk molding compound to replace aluminum. After graduation he’ll become a New Product Development Engineer for Watts Water Technologies in their heating and hot water sector.
GENERAL ENGINEERING

The Bachelor of Science degree in General Engineering is designed for students who have a clear idea of their educational goals but require a more flexible, interdisciplinary course of study. Students who enter the General Engineering program at Cooper desire a strong, broad-based, and rigorous engineering background as preparation for fields such as biomedical engineering, business, chemistry, computer science, entrepreneurship, law, mathematics, or medicine. General Engineering majors may take engineering courses along with relevant courses from Cooper’s other professional schools to tailor their studies to a specific career path.

STUDENT SNAPSHOT

Although students of the general engineering program are not required to have a senior project, Carena Toy ’20 cites her independent studies as a significant part of her final year. Carena worked with Dean Shoop to examine data related to 3D printing to see if there is a data-driven way to identify emerging technologies. Carena says that a Cooper education is moldable, allowing you to make it what you want it to be. Carena plans to apply to law school, a decision that was solidified after an independent study course on patent law with Professor Alan Wolf.
Students are given opportunities to pursue advanced projects and conduct independent study and research, drawing knowledge and skills from across their engineering coursework.

The Vertically Integrated Projects (VIP) Program is an interdisciplinary course structure supporting student projects that are guided by faculty mentorship and professional research. VIP team members earn academic credit for their participation in design and discovery efforts that enable them to explore their interests through long-term projects.

Engineering Design and Problem Solving is an immersive and interdisciplinary experience in which all first-year students engage with a challenge faced by humankind. In the past, students have addressed climate change, refugee crises, construction, and sustainable agriculture. They develop skills in teamwork, leadership, presentation and communication, and entrepreneurship while iterating through the engineering design process.

The Benjamin Menschel Fellowship Program supports work in the fields of art, architecture, design, and engineering. Funding is given to exceptional students who propose scholarly, independent projects that provide a culmination to their academic careers. Winning projects are completed over the summer prior to the student’s senior year and are featured in a prestigious exhibition.

Senior Design is the culmination of each program in a year-long course that integrates the principles of the major and applies them to an open-ended project that meets a particular need. Advised and critiqued by faculty, seniors navigate the engineering design process in small groups for the final time at Cooper, focusing their skills on a comprehensive engineering solution that is economical, sustainable, and professional.
**Team-Based Projects and Travel**

**THE MOTORSPORTS TEAM** builds a high performance open-wheel racecar and competes in the annual Formula SAE international design competition. Students get hands-on experience with state-of-the-art design, engineering, and manufacturing techniques.

**THE STEEL BRIDGE TEAM** competes in the American Institute of Steel Construction Student Steel Bridge Competition, which challenges students to develop a scale-model.

**THE CHEM-E CAR TEAM** competes annually against college teams to design small-scale automobiles that operate by means of chemical reaction and must give a technical poster presentation describing their research.

**INVENTION FACTORY** is a six-week summer program in which students compete to invent a tangible product that meets a significant need. Teams of two conceive an invention, research, build and iterate through prototypes. Students also file a provisional patent application and are scrutinized by a panel of distinguished designers, inventors, engineers, and patent attorneys who select the top invention.

**THE SUMMER STUDY ABROAD PROGRAM** provides students with the opportunity to conduct research or work on engineering-related projects at institutions around the world for the purpose of hands-on engineering practice, cultural immersion, and experience working on multicultural and interdisciplinary teams. Students have traveled to Iceland, Ireland, the United Kingdom, Belgium, Germany, Spain, Greece, Egypt, Ghana, Israel, Singapore, South Korea, and Japan.

Left to right, top to bottom:
Hack Cooper
Steel Bridge
Art, Architecture, Construction, and Engineering (AACE) Lab
Invention Factory
Motorsports
Study Abroad
Support for Interdisciplinary Research

Students and faculty across disciplines participate in ongoing, large-scale projects, supported by special lab facilities and research programs.

**THE AUTONOMY LAB** is dedicated to interdisciplinary collaboration for the design, innovation and development of solutions to reimagine our cities and systems as more economically, environmentally, and socially resilient. The lab focuses on areas in autonomous systems, urban agriculture, energy, and transportation. Students compete in the annual Intelligent Ground Vehicle Competition (IGVC) where autonomous driving technologies are implemented and tested in a real-world scenario.

**THE ART, ARCHITECTURE, CONSTRUCTION, AND ENGINEERING (AACE) LAB** serves as a catalyst for integration across the institution, with equipment supporting projects that involve “making”—from 3D printers to robotics arms to virtual reality technologies. The space will take advantage of one of Cooper’s longstanding salient qualities—translating intellectual activities into practical applications.

**THE MAURICE KANBAR CENTER FOR BIOMEDICAL ENGINEERING** provides facilities for tissue culture, genetic engineering, biomechanics, and related research. Topics of past research include biomedical devices, tissue engineering, protein synthesis, and obstructive sleep apnea biomechanics. Researchers also collaborate with several major New York City-based hospitals.
First-year students can elect to live in the residence hall where the camaraderie and shared interests among art, architecture, and engineering students in our close-knit community shapes their lives and future experiences at The Cooper Union. Each year there are roughly 80 student clubs, including professional organizations, cultural and social groups, intramural sports teams, and a student newspaper. The Cooper Union’s historic location in the East Village of New York City enriches the student experience with an abundance of cafés, galleries, theaters, restaurants, and cultural institutions.
Life After Cooper

CAREER DEVELOPMENT

The Center for Career Development provides resources and opportunities including career fairs, mock interviews, and professional workshops to help prepare students for life after graduation. The center also helps connect students with employers, graduate programs, and members of The Cooper Union alumni network.

Most engineering students complete two or more internships during their undergraduate studies, and many pursue research programs at universities and labs across the country and around the world. Engineering students’ internships, research, and post-graduate studies and careers span a wide variety of fields including infrastructure, technology, energy, defense and aerospace, automotive, the environment, health and medicine, business, and more. Graduates are recruited by global corporations, consulting companies, new ventures, and graduate schools nationwide.

ALUMNI

The Cooper Union has drawn some of the most brilliant and inventive minds of the past 160 years. Our alumni have revolutionized their disciplines and transformed society, with achievements ranging from the Nobel Prize-winning discovery of a binary pulsar, to developing the first Global Positioning System, to creating the prototype for the microchip, to designing the infrastructures that support everyday life in New York City. Our alumni have earned the school its reputation for excellence.

The Engineering Alumni-Student Career Mentoring Program matches students with alumni mentors for year-long, one-to-one advisory relationships, providing students with professional networking and support. The nearly 13,000 alumni of The Cooper Union span professions, continents, and generations. Alumni are found in the top management and research leadership of major corporations; hold key positions in federal, state, and city agencies; and distinguish themselves on university faculties and administrations nationwide.

Preparing for Admission

Upon graduation, prospective students should ideally have completed algebra, geometry, trigonometry, analytic geometry, pre-calculus, and calculus. Recommended science courses include biology, chemistry, physics, and calculus. Advanced coursework is encouraged if available.

UNDERGRADUATE APPLICATION REQUIREMENTS

- Common Application
- Application fee
- Official high school transcript
- High school counselor evaluation
- Two or three teacher recommendations (at least one STEM strongly encouraged)
- Common Application essay
- The Cooper Union Engineering Writing Supplement (available through the Common Application)
- English Proficiency Official Test (TOEFL, IELTS or DET), if applicable
- Standardized test scores are not required

APPLICATION DEADLINES FOR 2020/21

UNDERGRADUATE

- EARLY DECISION: SUNDAY, NOVEMBER 1, 2020
- REGULAR DECISION: TUESDAY, JANUARY 5, 2021

GRADUATE

- MASTER OF ENGINEERING: MONDAY, FEBRUARY 15, 2021

Affordability

The Cooper Union was founded on the principle of providing access to higher education regardless of race, creed, gender, or financial means. Every admitted student receives a half-tuition scholarship valued at $22,275 per academic year. Applicants will automatically be considered for additional merit-based scholarships. To be considered for need-based financial aid, students must submit the FAFSA (code: 002170).
The Student Residence Hall offers apartment-style housing for approximately 170 students during a typical year. Most apartments accommodate four students, comprised of two bedrooms with a shared bathroom and kitchen. The building is staffed by the residence hall director and eight resident assistants. There is a 24-hour security system, including guards, closed-circuit cameras, and alarms. Due to space limitations, Cooper Union is unable to guarantee housing, giving preference to first-year students. Assistance with off-campus housing is provided by the Office of Housing & Residential Education.
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