

Carnegie Mellon

GRADUATE STUDY IN ENVIRONMENT & SUSTAINABILITY

ARCHITECTURE

ART

CHEMICAL ENGINEERING

CHEMISTRY

**CIVIL & ENVIRONMENTAL
ENGINEERING**

ENGINEERING & PUBLIC POLICY

HISTORY

MATERIALS SCIENCE & ENGINEERING

MECHANICAL ENGINEERING



CARNEGIE MELLON'S UNIQUE INTERDISCIPLINARY APPROACH

ADMISSIONS TO GRADUATE PROGRAMS

FUNDING FOR GRADUATE STUDY

Carnegie Mellon University takes an interdisciplinary approach to teaching and research—encouraging collaboration among students and faculty across departments and colleges. This unique perspective fosters the growth of innovative discoveries that provide solutions to real-world problems in a variety of disciplines.

Several interdisciplinary programs for graduate study have grown from this approach. This brochure provides an overview of graduate programs offered at Carnegie Mellon that focus on sustainability and the environment. We encourage you to visit the websites listed, and to call or e-mail the programs if you have questions.

Additional research opportunities exist outside of the degree programs, such as the innovative exploration being done in on-campus centers such as the Center for Building Performance and Diagnostics, the Green Design Institute and the Steinbrenner Institute for Environmental Education and Research. See back page for a comprehensive list of Carnegie Mellon research centers that are breaking new ground in improving and sustaining our environment.

Admission to graduate programs is handled by the individual academic departments, and requirements and deadlines vary from department to department. For detailed information on the individual programs, refer to the contact information provided in the margin of each page.

Doctoral programs at Carnegie Mellon usually provide tuition and stipends for their students. Master's programs are typically not funded, but partial departmental assistance may be available. Additionally, various types of financial aid are available for master's and Ph.D. programs. For more information, contact the individual departments or Enrollment Services (www.cmu.edu/hub/fa/fa_grad.html).

General information regarding graduate education can be found at www.cmu.edu and through each department. General inquiries can be directed to grad-ed@cmu.edu.



On the cover, clockwise from upper left: **Interdisciplinary research teams** at Carnegie Mellon develop innovative methods to optimize plastic electronics for energy and environmental applications such as light emitting diodes, chemosensors and solar cells.

The Intelligent Workplace (also pictured at left), built atop Margaret Morrison Carnegie Hall, is a living laboratory that serves as a testbed for the materials, components and systems that will comprise the workplace of tomorrow. The cover photo shows the recycled aluminum facade and shading/light redirection louvers. **The Living Roof project** has retrofit some academic buildings with “green” roofs, which reduce cooling and heating energy consumption, protects the roof’s structural elements from UV rays, extends the life of the roof and reduces storm water waste streams. (Intelligent Workplace images courtesy of Karl Backus)

ARCHITECTURE

Our students hold undergraduate degrees in, among others

- architecture or landscape architecture
- planning or urban design
- ecology
- engineering or construction
- public policy or political science

Career paths include

- architectural practice
- research
- building and manufacturing industries
- federal or municipal government

For more information

www.arc.cmu.edu/cmu/programs/grad_progs
412/268-2363
msscphd@andrew.cmu.edu

Rapid growth in the developing world, climate change and energy availability have galvanized individuals, organizations and governments to commit to more sustainable practices that could yield potential benefits such as improved national security, new economic opportunities and better quality buildings and landscapes. The design and construction industries are at the forefront of this shift to sustainable practices. Carnegie Mellon University's School of Architecture provides students access to and engagement with the most current research on sustainable design practices.

The **M.S. in Sustainable Design** program builds on the expertise within our world-renowned research center, Carnegie Mellon's Center for Building Performance and Diagnostics, to meet the unique needs of those with prior experience in design and construction fields such as architecture, landscape architecture, engineering, construction, planning, public policy, product design and ecology. The program addresses the cross-disciplinary nature of sustainable design as well as skills and competencies that are specific to the core disciplines of design and construction.

The mission of the **Master of Urban Design (MUD)** program is to educate professionals about the economic, social and physical systems, and the participatory processes that create sustainable communities and regions. During the program, students develop the physical design expertise that is critical to establishing new directions in sustainable community design and policy.



In 2007, Architecture students from Carnegie Mellon participated in the **Solar Decathlon** in Washington, D.C. Sponsored by the U.S. Department of Energy, the contest challenges college and university teams from around the world to design, build and operate the most attractive and energy-efficient solar-powered house.

ART

Our students hold
B.A.s and B.F.A.s
from a variety of disciplines

Career paths include

- individual art-making in studio practice
- teaching
- fellowship and residency programs

For more information

artserver.cfa.cmu.edu/
412/268-2409
artscool@andrew.cmu.edu

Carnegie Mellon's School of Art encourages exploration among the many disciplines at Carnegie Mellon, and outreach to the greater Pittsburgh community.

The **M.F.A. in Art** program offers many opportunities for environmentally focused study and expression, including work with campus research centers such as the STUDIO for Creative Inquiry, the Center for Building Performance and Diagnostics and the Human Computer Interaction Institute (see Affiliated Centers on the back page). The outreach aspect of the program requires students to connect their artistic practice with a larger public sphere, typically off-campus and outside the art world.



This installation by an Art graduate student proved that **art can effect a positive change on the environment**. Built entirely of empty printer paper boxes, this graceful tower had a strong message for the campus community that paper usage adds up. Moreover, using the campus flagpole as the work's core conveyed what the artist saw as Americans' sense of a birthright to "consume recklessly."

CHEMICAL ENGINEERING

Our students typically hold undergraduate degrees in

- chemistry
- chemical engineering

Career paths include

- industry
- government
- academia

For more information

www.cheme.cmu.edu/
412/268-2243
chegrad@andrew.cmu.edu

The Department of Chemical Engineering's strong program in envirochemical engineering focuses on atmospheric modeling and measurement. Another strong focus in the department is in process design, with an emphasis on both optimization and minimizing environmental impact.

The **Master of Chemical Engineering (M.Ch.E.)** is a coursework-only degree that teaches fundamental chemical engineering principles, and provides a broader set of professional skills and/or exposure to other technical disciplines.

The **M.S. in Chemical Engineering** program prepares students to function in a professional research environment. Advanced chemical engineering coursework is supplemented with research training in the form of thesis research.

The **M.S. in Colloids, Polymers and Surfaces** program is relevant to many industries, as chemical product manufacture and process development often require applications involving complex fluids that include nanoparticles, macromolecules and interfaces.

Students pursuing the **Ph.D. in Chemical Engineering** become independent researchers with the ability to apply chemical engineering principles as well as advanced analytical and experimental techniques to the solution of large-scope, open-ended research problems.



Students and researchers examine data from a flow reactor in the **Center for Atmospheric Particle Studies Air Quality Laboratory**. Advanced instrumentation in the lab allows students to conduct detailed studies of chemical processes controlling the fate of pollutants in the atmosphere.

CHEMISTRY

Our students typically hold undergraduate degrees in

- chemistry
- environmental science

Career paths include

- research in industry or academics
- teaching
- government

For more information

www.chem.cmu.edu/grad
412/268-3150
vb0g@andrew.cmu.edu

Students wishing to focus on green chemistry and environmental research will find a wealth of opportunity within the Department of Chemistry. Research groups focus on such areas as sustainable chemistry to replace polluting technologies, water purification using state-of-the-art oxidation catalysis, the influence of organic oxidation mechanisms on the atmosphere, human health and global climate, and polymerization in environmentally friendly media.

Students in the **Ph.D. in Chemistry** program begin research quickly and develop their own original proposals, gaining excellent communication skills along the way to support a successful career. Students have opportunities to work in multidisciplinary groups with biologists and engineers and on applied projects with close ties to industry. The work may involve synthesis, catalysis, analytical work, computer modeling or field work.



A graduate student in the Collins group analyzes an extract containing oxidized products of pharmaceuticals in aqueous media after reaction with hydrogen peroxide and a newly designed FeTAML—an inorganic, catalytic mimic of catalase/peroxidase enzymes. **Fe-TAML provides a new green technology for decomposing pollutants in water effectively and simply.** Using GC-MS enables analysis of trace pollutants.

CIVIL & ENVIRONMENTAL ENGINEERING

Our students typically hold undergraduate degrees in

- civil, environmental, chemical or mechanical engineering
- biology, chemistry and environmental science
- mathematics
- physics

Career paths include

- civil, environmental, geotechnical, water resources and quality assurance engineering
- faculty positions
- post-doctoral and research positions
- development and project management

For more information

www.ce.cmu.edu/graduate/
412/268-2940
ce-admissions@cmu.edu

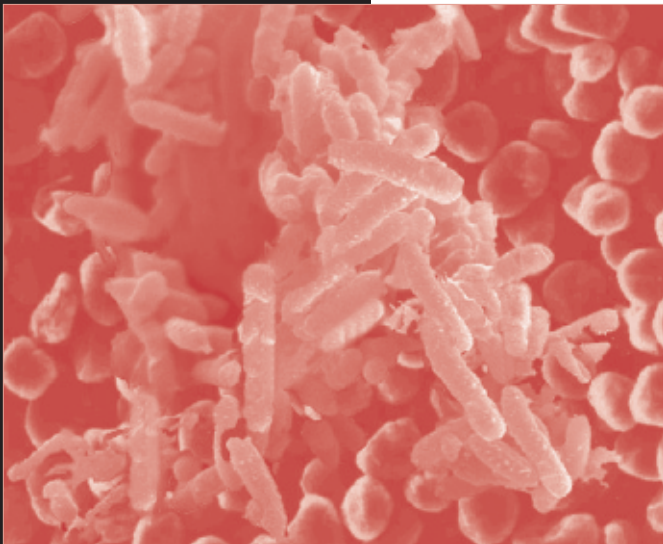
Graduate programs in the Department of Civil and Environmental Engineering prepare students for leadership roles in engineering practice, development and research. Although students typically focus their studies in one of the areas of specialization within the department, interdisciplinary work is strongly encouraged.

The **M.S. and Ph.D. in Civil and Environmental Engineering** are the official degree titles awarded by the department, but more specialized degrees are also offered.

Within the **M.S. and Ph.D. in Environmental Engineering** and **M.S. and Ph.D. in Environmental Management and Science** programs, specializations are available in air quality, environmental management, green design, water quality and environmental informatics. Students may engage in laboratory experiments, fieldwork or computer-based modeling.

Students interested in exploring the public policy aspects of civil and environmental engineering can pursue the jointly offered **Ph.D. in Civil and Environmental Engineering/Engineering and Public Policy**.

Jointly offered by the Department of Civil and Environmental Engineering and the Tepper School of Business is the **dual M.S. in Civil and Environmental Engineering (MSCEE) and Master of Business Administration (MBA)**. This program offers the opportunity to develop technical and managerial skills geared specifically toward the management of civil and environmental engineering organizations, projects and systems.



Colorized scanning electron micrograph of bacterial colonization of a graphite anode in a **biological fuel cell**.

ENGINEERING & PUBLIC POLICY

Our graduate students come from backgrounds in

- engineering
- science
- mathematics

Career paths include

- academia
- think tanks and consulting
- industry
- government

For more information

www.epp.cmu.edu
412/268-1462 or
412/268-2670
eppadmt@andrew.cmu.edu

The Department of Engineering and Public Policy prepares students for careers in policy research and analysis on problems in energy and environmental systems, as well as information and communication technology, technical innovation, R&D policy and technology for economic development. EPP's work in energy and environmental analysis addresses topics such as climate change, life-cycle analysis, the electricity system, clean coal, renewables, particle air pollution, water supply and quality, technical and policy innovation, and both the technical and social aspects of sustainability.

The **Ph.D. in Engineering and Public Policy** is a rigorous program that combines engineering and science with methods in the social and behavioral sciences, economics, political science and law. Core courses address fundamental approaches and methods for research in engineering and public policy. A **collaborative Ph.D. program with several Portuguese universities** is also available (see www.epp.cmu.edu/httpdocs/graduate/index.html).

EPP typically does not admit terminal M.S. students, but does **offer an M.S. to students on the way to their Ph.D. under special prior arrangements**, or as part of a **five-year B.S.-M.S. program** in the department. As a technical alternative to an M.B.A., the department also manages a one-year **M.S. in Engineering and Technology Innovation Management**.

In some cases, students may also pursue a **joint M.S. or Ph.D. between Engineering and Public Policy and traditional engineering departments or computer science**.



EPP students and faculty are **exploring technologies and policies to meet future energy needs** while minimizing environmental impacts, including climate change. Their focus extends to end-use efficiency, the practical integration of renewables, and advanced operation and control of power systems.

HISTORY

Our students typically hold undergraduate degrees in

- history
- other academic fields related to their dissertation interest

Career paths include

- academia
- policy research
- public history

For more information

[www.hss.cmu.edu/
departments/history/grad.html](http://www.hss.cmu.edu/departments/history/grad.html)
412/268-2880
grad-director@andrew.cmu.edu

A key area of research within the Department of History is how environmental history and policy have led to contemporary problems. Research examples include the environmental history of cities and the impact of their technological systems; the social and environmental impacts of export commodities; and the interdisciplinary exploration of environmental technologies, which abate or eliminate the negative environmental effects of other technologies.

Students pursuing the **Ph.D. in History** may choose among several faculty to guide their dissertations in environment-related topics. Students have the option of drawing on elective courses in Carnegie Mellon's other departments and professional schools in completing the course work for their dissertations.



A recent book by a History Department faculty member explores the impact of horses working in the city. As an integral part of daily life, **horses affected both the economy and the urban environment.**

MATERIALS SCIENCE & ENGINEERING

Our students typically hold undergraduate degrees in

- materials science
- physics
- chemistry
- chemical engineering

Career paths include

- industry
- government
- academia

For more information

<http://materials.cmu.edu>

412/268-7574

matsci@andrew.cmu.edu

The Department of Materials Science and Engineering has faculty conducting research in a number of environmentally related fields, with a focus on energy systems. These include materials for solid oxide fuel cells, PEM fuel cells, batteries, super capacitors, photovoltaic devices and photocatalysts.

The **M.S. in Materials Science and Engineering (coursework option)** is a coursework-only degree that teaches fundamental materials science and engineering principles, and provides a broader set of professional skills and/or exposure to other technical disciplines.

The **M.S. in Materials Science and Engineering (research option)** program prepares students to function in a professional research environment. Advanced materials engineering coursework is supplemented with research training in the form of thesis research.

Students pursuing the **Ph.D. in Materials Science and Engineering** learn to execute independent research on cutting-edge topics. In the case of projects that are related to energy technology, emphasis is placed on relating materials properties to performance in applied environments.



An MSE student prepares a sample for thermo-gravimetric analysis. This experiment can examine the thermal stability of materials for application in energy devices such as **fuel cells and batteries**.

MECHANICAL ENGINEERING

Our students typically hold undergraduate degrees in

- engineering
- science

Career paths include

- industry
- government
- academia

For more information

www.me.cmu.edu/

412/268-3175

meche-admissions
@andrew.cmu.edu

Students seeking a graduate degree in mechanical engineering with an emphasis on energy and environmental research will find a wealth of opportunity within the Department of Mechanical Engineering. Research groups focus on such areas as energy technologies, air quality and global change, energy consumption and environmental impact of buildings, and green design and the impact of environmental regulation on product design.

The **M.S. Degree Course Work Option** is ideal for the student who wishes to complete the M.S. in two semesters, allowing the student to move quickly toward the Ph.D. or industry employment. The option consists primarily of graduate-level course work, but with the opportunity to undertake research under the supervision of a faculty member.

The **M.S. Degree Project Option** consists of a mix of course work and independent research, the culmination of which is a final research report and presentation to faculty and students. Course requirements for this option are fewer than those for the Course Work Option; however, because of its added emphasis on research, students typically complete this degree after four semesters and one summer.

The **Ph.D. in Mechanical Engineering** combines coursework and research that involves active, student-directed inquiry into an engineering problem. Upon completion of his or her dissertation, the student will be an international expert in a technical area.



The sampling trailer for the Pittsburgh Air Quality Study. Research in the air quality group includes strong components in modeling, laboratory studies and ambient measurements. Supporting these research areas are **state-of-the-art facilities designed to promote collaborative work.**

CARNEGIE MELLON UNIVERSITY

Founded in 1900 by industrialist and philanthropist Andrew Carnegie, Carnegie Mellon University today is a world-class research university of about 7,500 students and 3,000 faculty, research and administrative staff. Students represent all 50 states and more than 100 countries.

The university consists of seven colleges and schools: the Carnegie Institute of Technology (engineering), the College of Fine Arts, the College of Humanities and Social Sciences, the H. John Heinz III School of Public Policy and Management, the Mellon College of Science, the School of Computer Science and the Tepper School of Business. In its annual rankings, U.S. News and World Report consistently rates several of Carnegie Mellon's programs highly, including those in the fields of engineering, computer science, design, art, business, and public policy and management.

Carnegie Mellon is located in Pittsburgh, Pennsylvania, with a greater metropolitan area of more than 2 million residents. The campus encompasses approximately 100 acres and adjoins a 500-acre park and residential communities with abundant student housing.

Carnegie Mellon
5000 Forbes Avenue
Pittsburgh, Pennsylvania 15213
412/268-2000
www.cmu.edu

AFFILIATED CENTERS

Carnegie Mellon encourages collaboration across departmental, college and institutional boundaries, continuing the university's strong tradition of interdisciplinary research. Many faculty members have joint appointments, and adjunct faculty members complete the wide array of expertise available to students. Through research, coursework and seminars, students enjoy opportunities to expand their knowledge in interrelated areas. The centers listed here also provide opportunities for students to broaden their study.

Center for Atmospheric Particle Studies caps.web.cmu.edu/

Center for Building Performance and Diagnostics
www.arc.cmu.edu/cbpd

Center for Business, Technology and the Environment
www.hss.cmu.edu/departments/history/research/btctr.html

Center for Integrated Study of the Human Dimensions of Global Change hdgc.epp.cmu.edu/

Center for Iron and Steelmaking Research
neon.mems.cmu.edu/cisr/cisr.html

Center for Nano-Enabled Devices and Energy Technologies
www.ices.cmu.edu/cnxt.html

Center for the Study and Improvement of Regulation
www.epp.cmu.edu/csir/

Design Decisions Laboratory www.cmu.edu/me/ddl/

Electricity Industry Center wpweb2.tepper.cmu.edu/ceic/

Green Design Institute www.ce.cmu.edu/GreenDesign/

Institute for Green Oxidation Chemistry
www.chem.cmu.edu/groups/collins/

Steinbrenner Institute for Environmental Education and Research www.cmu.edu/steinbrenner/

STUDIO for Creative Inquiry www.cmu.edu/studio/

Water Quality in Urban Environmental Systems
www.ce.cmu.edu/~wquest/

Check out www.cmu.edu/environment/ for links and more information on environmental education, research and practice at Carnegie Mellon.

Carnegie Mellon University does not discriminate and Carnegie Mellon University is required not to discriminate in admission, employment, or administration of its programs or activities on the basis of race, color, national origin, sex or handicap in violation of Title VI of the Civil Rights Act of 1964, Title IX of the Educational Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973 or other federal, state, or local laws or executive orders.

In addition, Carnegie Mellon University does not discriminate in admission, employment, or administration of its programs on the basis of religion, creed, ancestry, belief, age, veteran status, sexual orientation or gender identity. Carnegie Mellon does not discriminate in violation of federal, state, or local laws or executive orders. However, in the judgment of the Carnegie Mellon Human Relations Commission, the Presidential Executive Order directing the Department of Defense to follow a policy of "Don't ask, don't tell, don't pursue" excludes openly gay, lesbian and bisexual students from receiving ROTC scholarships or serving in the military. Nevertheless, all ROTC classes at Carnegie Mellon University are available to all students.

Inquiries concerning application of these statements should be directed to the provost, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-6684 or the vice president for enrollment, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-2056.

Carnegie Mellon University publishes an annual campus security report describing the university's security, alcohol and drug, and sexual assault policies and containing statistics about the number and type of crimes committed on the campus during the preceding three years. You can obtain a copy by contacting the Carnegie Mellon Police Department at 412-268-2323. The security report is also available online at www.cmu.edu/police/csr.htm.

Obtain general information about Carnegie Mellon University by calling 412-268-2000.