Environmental Engineering Science and Management (EESM): Concentration in Green Design

Vision

Green practices and responsible environmental stewardship will enable sustainable growth and a healthy environment. Engineers of the future require experience in addressing complex problems from various perspectives that can only be gained from interdisciplinary research and education that spans engineering, science, social sciences, and policy.

EESM at Carnegie Mellon represents the next generation of interdisciplinary education and research in environmental science and engineering. Forward-looking faculty of the Green Design Institute lead interdisciplinary efforts to provide novel perspectives and cutting edge skills for environmental stewardship and sustainability.

Green Design Institute Professionals

The key researchers in Green Design have backgrounds in civil and environmental engineering, economics, business, public policy and microbiology. They include: Professors Chris Hendrickson, Lester Lave, H. Scott Matthews, Cliff Davidson and Director Mike Griffin and Research Associate Deanna Matthews.

This diverse group leads exciting research related to economic, social, and environmental analysis of projects and systems.

Example Research and Outreach Projects:

Environmental Life Cycle Assessment. We are assessing the areas of product and infrastructure life cycles that lead to the greatest environmental and energy impacts. Past analyses have examined wired versus wireless infrastructure, telecommuting, and on-line purchasing and shipping options. These projects utilize the EIO-LCA Internet tool (http://www.eiolca.net) developed by Green Design Institute researchers over the last 10 years.

Infrastructure Requirements of Alternative Fuels. This interdisciplinary project is developing models to consider the economic and environmental burdens of emerging alternative fuel pathways, such as hydrogen, ethanol, and plug-hybrid vehicles. This project combines work on the impacts of producing the fuels with analysis of the amounts and impacts of the infrastructure needed to deliver the energy to the consumer. This is important because much existing research neglects infrastructure impacts.

Environmental Impacts of Electricity Production. In collaboration with the Carnegie Mellon Electricity Industry Center, we are working to create better national and state models that consider the economic and environmental impacts of producing electricity. This project considers interstate trading of electric power and re-estimates state mixes of electricity, and the benefits and costs of renewable electricity sources. We are also specifically interested in the differences in life cycle emissions and impacts of current and emerging generation technologies.

Biofuels. We are developing models to consider the regional sources of biofuels as well as the cost and net energy and environmental impact of producing them. Recent work has combined GIS modeling and quantitative optimization methods to examine using switchgrass for ethanol production and distribution scenarios in the US, as well as using switchgrass for co-firing in electric power plants.

Green Construction. In conjunction with University of Pittsburgh researchers, we seek to increase our understanding of the environmental impacts of the construction process, construction industry support services, and community development in regard to the increased demand for energy and resource efficient building design. Such work is important in efforts such as green building projects and LEED certification.

Sustainable Consumption. We are studying the link between what consumers know and understand about what they buy, and how giving them more information may reduce the environmental impacts of their purchases. At the same time, we are making models to estimate how increasing international trade is affecting the global environmental footprint of consumers.

Sustainability Education. We are leading an effort with the University of Texas-Austin and Arizona State University to develop and disseminate teaching modules for courses in science and engineering that incorporate elements of sustainability. The project is also benchmarking the degree to which sustainability is becoming pervasive in undergraduate and graduate programs in science and engineering.

Teaching Life Cycle Assessment. An important aspect of environmental sustainability research is educating broader audiences. We have worked extensively to develop courses and materials for graduate, undergraduate, and K-12 students, as well as informal educational experiences for broader audiences.

MS Concentration in Green Design Course Only Track

As an extension to a traditional engineering or science bachelor's degree, we offer a course only M.S. degree program with a concentration in Green Design and Sustainability. The degree requires 96 credits of graduate level coursework in Civil and Environmental Engineering or related departments. Recommended courses and a sampling of potential elective courses are shown below for an appropriate course of study. Participants in this specialization area work closely with the Green Design Institute faculty in course and special project work.

Sustainability/Green Design Specialty Courses

12-712	Sustainability (6 units)
12-713	Environmental Management (6)
12-714	Environmental Life Cycle Assessment (6)
12-715	Case Studies in Sustainability Engineering (6)
12-716	Advanced Life Cycle Assessment (6)

Crosscutting Courses

12-704	Probability and Estimation Methods for Engineering Systems (12)
12-706	Civil Systems Planning (12)
12-720	Water Chemistry (12)
12-726	Mathematical Modeling of Environmental Quality Systems (12)
12-750	Infrastructure Management (12)
12-751	Air Quality Engineering (12)
19-731	Challenges and Opportunities in the Electric Industry (12)
48-596	LEED Buildings and Green Design (9)

M.S. & Ph.D. Concentration in Green Design Research Track

A traditional research program culminating in a thesis or dissertation is also available to qualified students. Students with a wide range of prior educational degrees – engineering and science related, have been accepted.

M.S. students typically take 1-2 years to complete a degree. Applicants to the PhD program having an M.S. degree in environmental engineering or related engineering field have no specific coursework requirements, however most students take at least four courses related to their research. Ph.D. students typically take two to three years to earn a degree when working with faculty in the Green Design Institute. Financial aid is possible but is prioritized to students pursuing research M.S. and Ph.D. degrees.

Please Contact Us:

Green Design Institute – Admissions
Dept. of Civil and Environmental Engineering
Carnegie Mellon University
Pittsburgh, PA 15213-3890

Phone: **(412) 268-2940**
FAX: **(412) 268-7813**
Web: **gdi.ce.cmu.edu/**
E-mail: **greendesign@andrew.cmu.edu**

On-line application process at:
www.ce.cmu.edu/admissions/

Environmental Engineering Science and Management

Concentration in Green Design

Research and Education Opportunities

Civil and Environmental Engineering
Carnegie Mellon University