

# Fusing Engineering with Liberal Arts

By JEFFREY THOMAS

The Smith College engineering program was designed specifically for women.



JIM GIPE



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In 2006 and 2007, Ida Ngambeki of Uganda, Leonora Baddoo of Ghana, June Yeung, originally from Hong Kong, and Meghan Irving of New Hampshire volunteered 1,658 hours to design a culvert for the restoration of the Weir Creek Salt Marsh in Dennis, Massachusetts. The project fulfilled a requirement for their education as engineers at Smith College, which 10 years ago created the first engineering program at an all-women liberal arts college and the first specifically designed for women.

The project involved much more than simply creating a design. They researched salt marshes, modeled tidal flow into the marsh, planned and developed alternatives for the site, and finally prepared a design, construction specifications and a cost estimate.

Their project was not unique at Smith, where students take a hands-on approach to engineering science within the context of broader social and environmental issues.

Some of the design projects other teams worked on included:

- A desktop computer that can withstand tropical conditions.
- A power-source system for Ford vehicles.
- A fuel cell and manure digester to create electricity at a dairy farm.
- An online book exchange site for Smith College.
- A new, residential, solid waste transfer

station for Northampton, the town in which Smith is located.

- A software tool that can help consumers decide how to respond if power companies price electricity based on the time of day power is used.

While seniors were collaborating in teams on these projects, first-year students were building a miniature town of energy-efficient solar buildings, drawing their inspiration from cultures around the world.

“From the very beginning, Smith engineers learn how engineering science principles are applied to design and practice through hands-on, project-based learning,” says Kristen Cole, Smith’s director of media relations.

## Changing how engineers are educated

Smith’s focus on project-based learning—which begins with the first introductory design course and continues through the senior-year Design Clinic—is unusual. The overwhelming majority (83 percent) of teachers in engineering programs nationally use lectures and discussion as the “primary instructional method” for undergraduate classes, according to a report by the National Science Board.

Also unique is Smith’s attempt to fuse engineering and liberal arts with the aim of producing technically competent professionals who engineer in a socially

responsible fashion with an eye toward sustainability.

Smith’s bachelor’s degree in engineering science “means you learn the fundamentals of several engineering disciplines so you can make an informed choice about the field,” Cole says. “The engineering program is integrated with Smith’s extensive liberal arts curriculum and all the resources of a top-tier institution. Because Smith has an open curriculum, other than the requirements for the engineering degree, a student does not have any other course requirements—she can take a variety of courses that reflect the range of her interests.”

Glenn Ellis joined the Smith faculty in 2001 as the new engineering program was getting started and went on to win a 2007 Professor of the Year Award from the Carnegie Foundation for the Advancement of Teaching and the Council for Advancement and Support of Education—an American award for excellence in undergraduate teaching and mentoring.

In his remarks when accepting the award, Ellis described the community of faculty and students working in the program at Smith as “attempting to change the way engineers are educated—and, beyond that, the nature of the profession

### For more information:

Smith College

<http://www.smith.edu/>

Indian Women Scientists’ Association

<http://www.iwsa.net/>

itself, its relationship to the liberal arts, and the role of women in it.”

“For us, this means changing *what* we teach, by emphasizing the interaction of engineering with society and its role in

servicing humanity and sustaining our planet,” he continued. “It also means changing *how* we teach—by empowering the learner and by making the climate welcoming and supportive for all students.”

## Professors are accessible

While the participation of women in some areas of science, technology, engineering and mathematics, known as the “STEM” fields, has risen dramatically since the 1960s, in others, notably engineering, it has remained conspicuously low. Women receive only 20 percent of bachelor’s degrees in engineering, according to a National Science Board report.

Smith is unusual in offering not only a bachelor of science degree in engineering, but also a bachelor of arts degree in the field, enabling Smith engineers to take an education degree and teach if they choose. Today, more than 100 women are enrolled in the program, making engineering one of Smith’s most popular majors.

Smith’s engineering program has achieved retention rates far exceeding the national average—more than 90 percent.

“Our engineers say that extensive access to faculty is one of the most valuable aspects of the program,” Cole says. “At Smith, courses are not taught by graduate student instructors, and students do not focus on theories for months before applying them. Professors are accessible to share ideas and

*Above left: Research assistant Indira Deonandan (from right), assistant professor of engineering Paul Voss, Jennifer Kirk, Pamela DeAmicis and Tom Hartley work on satellite-controlled balloons to track air pollution in a Smith College lab.*

*Above: Two students explore Smith’s Botanical Gardens.*

suggest new approaches,” she says.

As the engineering program celebrates its 10th anniversary, Smith is opening a new state-of-the-art facility for engineering and the sciences.

Those in the class of 2009 who majored in engineering went on to enroll in some of the world’s top graduate schools or to accept positions with such organizations as NASA’s Kennedy Space Center, General Electric, Sikorsky Aircraft and Lockheed Martin Space Systems Company, Cole says.

“Smith graduates are informed global citizens, responsive to challenges of the communities in which they live,” Cole says. “Smith expects all graduates to acquire the ability to think critically and analytically; speak and write clearly and persuasively; know and use quantitative skills; know how to lead and follow; apply moral reasoning to ethical problems; and understand issues in historical and comparative perspectives.”

*Jeffrey Thomas is a staff writer with America.gov*