

## Multi-university, interdisciplinary engineering ethics curriculum developed

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BLACKSBURG, VA., September 3, 2008 -- Does the responsibility of an engineer cease after providing professional advice or does it involve additional advocacy? Consider such questions as whether oil fields should be established on the North Slope of Alaska or whether a renewed effort should be undertaken to build nuclear power plants. Should a dam be built that would help prevent flooding but severely impact the environment? Should robots be built that would increase manufacturing efficiency but put large numbers of people out of work?

Virginia Tech faculty members from engineering, business, and philosophy posed the question of responsibility in a proposal to the National Science Foundation (NSF) to establish an interdisciplinary graduate curriculum in engineering ethics. "Our college is committed to pursuing education and research that addresses critical thinking," said [College of Engineering](#) Dean Richard C. Benson.

The National Science Foundation has awarded \$300,000 for the first three years of the Graduate Interdisciplinary Liberal Engineering Ethics Curriculum (GILEE). Virginia Tech is collaborating with Politecnico di Milano in Italy and Jadavpur University in India, which will assist in introducing global perspectives into the curriculum. North Carolina A&T State University, one of the historically black colleges and universities (HBCU) and the University of Illinois at Chicago will test courses developed by Virginia Tech. Graduate course offerings will begin at Virginia Tech during the spring semester, which begins Dec. 1, 2008.

"The GILEE proposal grew out of another interdisciplinary project that was funded by NSF," said project leader Iswar Puri, engineering science and mechanics department head at Virginia Tech. "Last year, we proposed a nanotechnology undergraduate program. One of [its] topics is a course on the societal and ethical implications of nanotechnology. It seemed natural that such a course could be synergistic with a curriculum for graduate education."

Puri said, "The NSF panel was particularly impressed by our focus on emerging technologies, such as nanotechnology, and on our effort, which has already been partially implemented, to assess how graduate students integrate the societal and ethical implications of their education and research into their professional preparation."

The proposal was facilitated by Virginia Tech's new [Institute for Society, Culture and Environment \(ISCE\)](#), whose mission is to strengthen the university's competitive position in the social sciences, arts, and humanities. Institute Director Karen Roberto "played a critical role in getting the team together, particularly by introducing me to Joe Pitt, professor of philosophy, and Rich Wokutch, professor of management," Puri said. "Those of us in engineering -- Vinod Lohani, Roop Mahajan, and I -- knew where we wanted to go but Joe and Rich are a critical piece of the team."

Lohani, associate professor in the Department of Engineering Education, has implemented innovative activities and ethics modules to expose engineering freshmen to contemporary engineering research

and technology issues and has implemented a number of assessment tools to assess learning outcomes.

Mahajan, the Tucker Chaired Professor, an engineering science and mechanics faculty member, and director of the Institute of Critical Technology and Applied Science, has published works on “humanistic engineering” and “nanotechnology and society,” and developed ethical and societal modules in the undergraduate engineering curriculum at the University of Colorado, before coming to Virginia Tech.

The Virginia Tech proposal to the National Science Foundation states, “Engineering practices are increasingly interdisciplinary and operate in many organizational and societal contexts. Students will develop team, communication, ethical reasoning, societal and global contextual analysis skills, as well as interpersonal skills to work with experts from diverse disciplines, without sacrificing technical depth. Our inclusion of national and international testing sites assists in the dissemination of our educational project and its broader utility, particularly for adoption and adaptation. A broad based dissemination plan covers engineering, humanities, and business disciplines. Our partnership with an HBCU and ongoing collaboration with the Office of Multicultural Affairs at Virginia Tech will help us recruit underrepresented faculty members, graduate students, and undergraduate seniors to take and enhance the GILEE curriculum.”

The program will

1. Develop a course for graduate students and seniors interested in graduate school, which will consist of various ethics training modules;
2. Develop summer training workshops for students and for faculty members;
3. Develop a seminar series related to engineering ethics, which will be integrated with the 15-year program of business ethics seminars in the Pamplin College of Business; and
4. Include ethical issues in the Ph.D. preliminary examination and presentation of learning modules by graduate students during the examination.

Course topics will include

- The Social Construction of Technology;
- Defining Emerging Technologies: Nano in Science and in Science Fiction, and History of the United States National Nanotechnology Initiative;
- Politics and Policy: Comparisons of National “Ethics Policy” Programs around the World;
- Ethical Implications: Environmental, Health and Safety Issues, Privacy and Security Issues, Human Enhancement Issues, and Equity and Access Issues; and
- Sociotechnical Integration: The Role of Regulation, Role of the Public, Role of the Engineer, and Seamless Integration of Science and Society.

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