



2005-2006

Annual Report

Rowan University College of Engineering

Cover: An engineering student examines separation performance in a packed column experiment.

TABLE OF CONTENTS

- 1** Message from the Dean
- 2** Visionary
- 4** Creative
- 6** Practical
- 8** Responsive
- 10** Entrepreneurial
- 12** Collaborative
- 14** Innovative
- 16** Accomplished
- 17** Message from the Chairperson,
Dean's Advisory Council



MESSAGE FROM THE DEAN

Another exciting year has passed and I am pleased to share some highlights and major impacts of our programs. Rowan Engineering continues to be a leader in experiential learning as exemplified by our hallmark, the engineering clinics.

The clinics, eight semesters of projects that start at the beginning of the freshman year, introduce students to the essence of engineering in an interdisciplinary mode. Supported by extensive external funding averaging more than \$2 million annually, junior/senior clinics bring small teams of students together to address real-world projects. Teams averaging three to five students worked on 128 clinics this year.

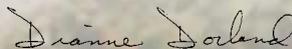
Our engineering program remains visionary. This year Rowan approved a multi-disciplinary bioengineering concentration, offering students the strength of a degree in well-recognized disciplines with the added value of emerging technologies for their future careers.

Through outreach, the College continues to be committed to the community, both locally and globally. Our

thriving Engineers Without Borders - USA™ chapter, along with other engineering clinics, offers students opportunities to have social and humanitarian impact, reinforcing the importance of engineering in the world.

We promote entrepreneurial thinking in the college, and our engineering clinics offer innovative opportunities for reaching into the K-12 education system. We have developed an Engineering Clinics for Teachers program that promises to assist teachers in science, math and engineering education, impacting the quality of our future students' technical foundation and strengthening K-12 education.

The clinic concept of hands-on learning permeates the curriculum and is reflected in student achievement and teaching excellence throughout the College of Engineering. We hope you enjoy reading these highlights.



Dianne Dorland

Dr. Dianne Dorland
Dean



“We ground students in a core discipline and then give them the language and tools to solve problems in these areas.”

Dr. Jennifer Kadlowec, associate professor of mechanical engineering

The College of Engineering always moves ahead in its commitment to excellence in engineering education and its relevance to today's world. One example of this commitment is Rowan's new bioengineering concentration, which adds a dimension to the comprehensive hands-on, minds-on education offered by the College. Meshing the fields of engineering with biology and medicine, the recently approved multidisciplinary program includes existing and new courses in all engineering areas plus biology, chemistry and biochemistry classes in the College of Liberal Arts & Sciences.

“We ground students in a core discipline and then give them the language and tools to solve problems in these areas,” said Dr. Jennifer Kadlowec, associate professor of mechanical engineering. Recent examples of the College's real-world, cross-disciplinary bioengineering clinic projects include investigating a more efficient

method to remove palladium from a pharmaceutical reaction mixture, designing a new leg brace and understanding the “machines” of the human body.

For the concentration, students will take 18 semester hours of approved coursework that focus on advancing technology and science to benefit society. “With the increasing demand for health industry professionals in clinical, industrial and government settings, there is a need for well-trained engineers who can design and develop ways of improving quality of life,” Kadlowec said.

“Our industrial feedback emphasizes a need for graduates with core engineering degrees in many disciplines and focus in areas like bioengineering,” said Dr. Dianne Dorland, dean of the College of Engineering. “This program addresses our graduates' needs, not just for today, but also for their future careers.”



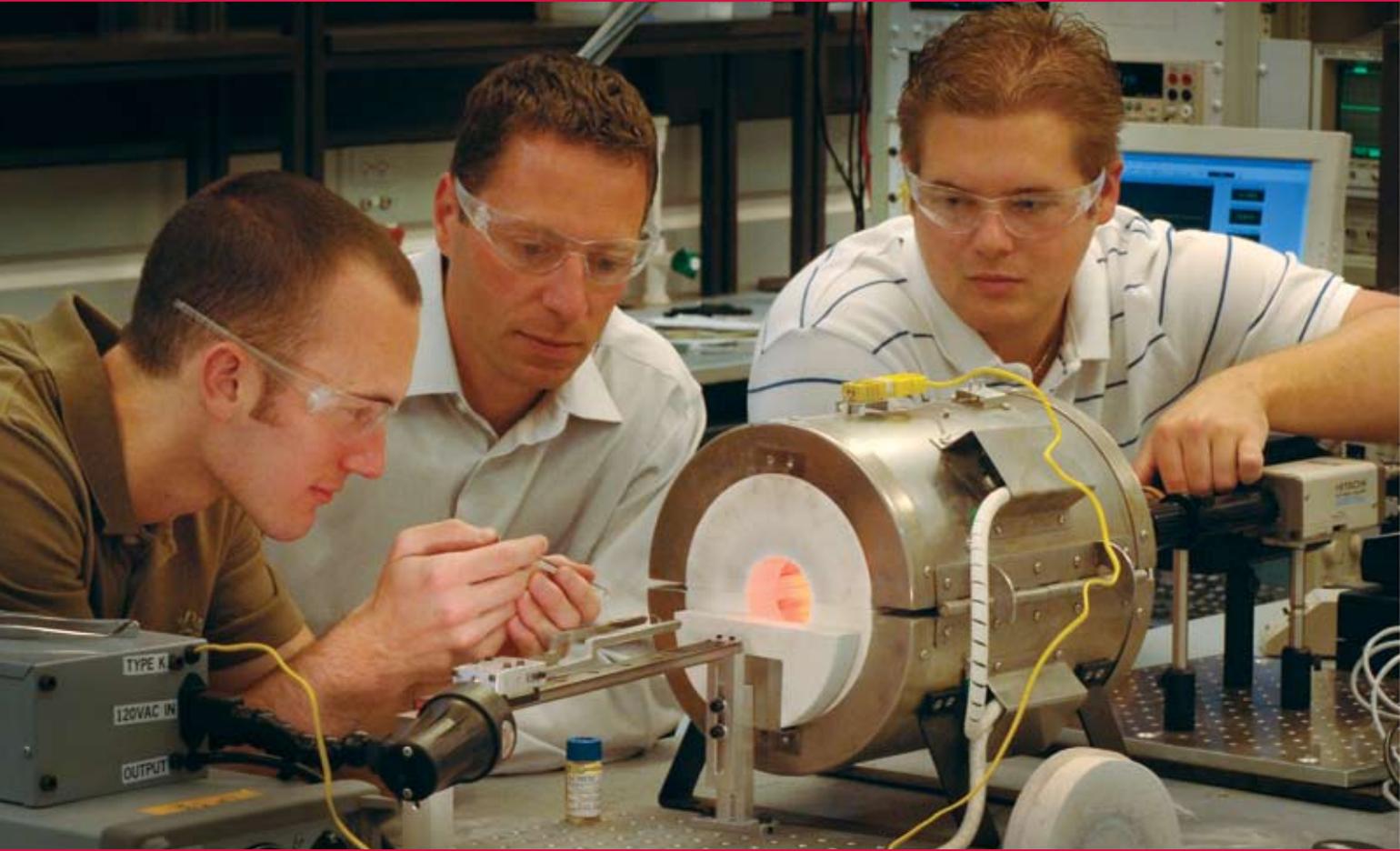
Dr. Stephanie Farrell, associate professor of chemical engineering (second from left), and her students investigate the flow rate and composition of respiratory gases as well as the mechanical resistance of a bicycle in an engineering clinic. The data analysis determines both energy expenditure and mechanical efficiency.



Wen Ho and Dr. Jennifer Kadlowec, associate professor of mechanical engineering (right), mix bone cement as part of a clinic project for Stryker Orthopaedics.

VISIONARY

CREATIVE



Dr. Anthony Marchese, associate professor of mechanical engineering (center), and his students perform a droplet ignition delay experiment, which is part of research to develop bio-fuels that produce lower NO_x emissions. The droplet is injected into a high-temperature furnace, and an ultraviolet camera is used to determine when the droplet ignites.

Easing costs — at the pump and to the environment — is the goal of Rowan researchers who seek to streamline ethanol production, reduce vehicle emissions and move the University towards sustainability.

With assistance from a National Science Foundation grant, engineering teams currently are focused on developing a “superbug” that combines the best characteristics of previously developed bacteria strains. The new bacteria will enhance the production of ethanol from corn stover, the plant parts that remain after harvest.

“The overall goal is to improve our ability to produce ethanol from renewable sources,” said Dr. Brian Lefebvre, assistant professor of chemical engineering. “This will help relieve our national dependence on foreign oil and establish a path to energy independence.”

Engineers are also exploring biodiesel exhaust emissions through a New Jersey Department of Transportation grant. Dr. Anthony Marchese, associate

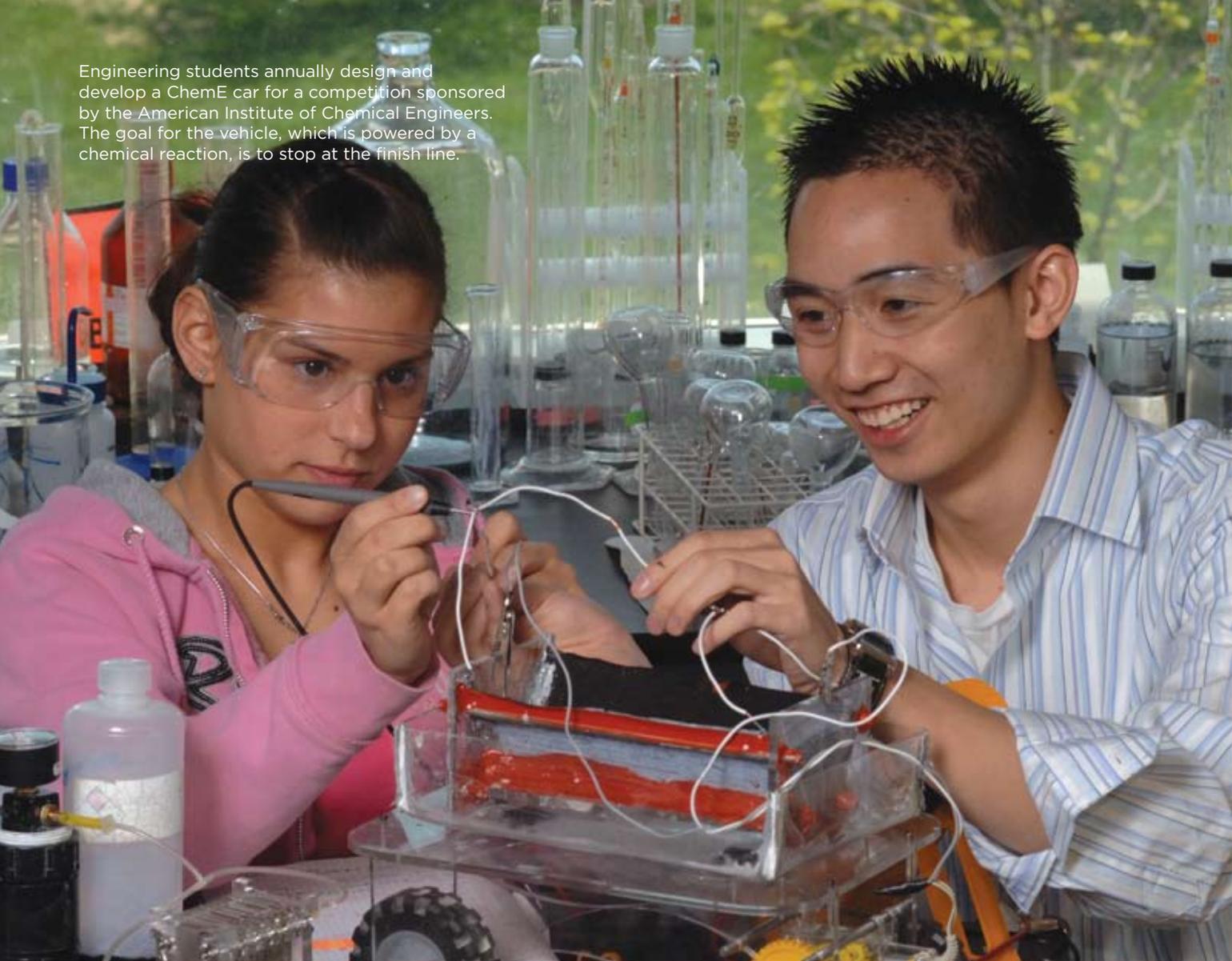
professor of mechanical engineering, and Dr. Robert Hesketh, professor and chair, Chemical Engineering, are quantifying emissions under realistic conditions. “Most engine studies have shown that NO_x emissions increase slightly with biodiesel, which impacts atmospheric pollution,” Marchese said. “However, when you test these biodiesels in actual on-road conditions, you sometimes don’t see as much NO_x emission as you do in the lab. What we’re finding is the results aren’t as bad as people expect.” Marchese also is conducting research on biodiesel combustion chemistry that could result in even cleaner-burning biodiesel.

Energy efforts also include the College’s promotion of renewable energy on campus. Highlighting this work are wind turbine investigations, campus energy audits and a student-designed-and-installed campus photovoltaic system to decrease fossil fuel dependence and reduce greenhouse gases. All these initiatives demonstrate that the University creatively leads by example on the way to sustainability.

Funded by a National Science Foundation grant, a collaborative effort between the College of Engineering and the College of Liberal Arts & Sciences focuses on developing improved bacterial strains for bioethanol production. Dr. Brian Lefebvre, assistant professor of chemical engineering (right), works with a student to test the new strains in a fermentor.



Engineering students annually design and develop a ChemE car for a competition sponsored by the American Institute of Chemical Engineers. The goal for the vehicle, which is powered by a chemical reaction, is to stop at the finish line.



PRACTICAL

The College of Engineering's signature clinic sequence encompasses diverse hands-on, minds-on projects that students work on throughout their undergraduate years.



ABOVE: As part of their work in “Emerging Topics in Mechanical Engineering,” students modify a standard wheelchair so that handlebars can propel the chair and avoid potential shoulder injuries from a hands-on-the-rim pushing motion.

TOP RIGHT: Students design and construct their entry for a steel bridge competition.

BOTTOM RIGHT: Dr. Gina Tang, assistant professor of electrical and computer engineering, and her student check the condition of an electronic chip. Their data analysis helps develop a computational model for electronic disassembly.

RESPONSIVE

Rowan engineering students and others from across campus volunteered in Louisiana in the wake of Hurricane Katrina.



Engineering faculty and students regularly reach out to the community to do what they do best — apply their skills to real-world projects — and help others at the same time.

Last year, that aid included rebuilding structures for the school district in Picayune, Miss., volunteering with Habitat for Humanity in Louisiana and designing a fish hatchery for the Cheyenne in South Dakota through Engineers Without Borders - USA™ (EWB - USA).

Rowan engineers responded quickly last fall after Hurricane Katrina devastated the Gulf Coast. Teams worked initially in the Picayune School District reconstructing sports facilities. More recently, engineering students and faculty and others from across campus volunteered to refurbish houses with Habitat for Humanity in Louisiana's St. Bernard Parish during spring break.

“Professors organized the Louisiana trip to include opportunities for reflection and discussion,” said Dr. John Schmalzel, chair, Electrical and Computer Engineering. “It’s one thing to discuss dams and levees on campus, but it’s another to talk about them when working in a region where a flood wall actually failed.”

Rowan’s outreach also includes ongoing assistance as part of EWB - USA, most recently developing a guide to assist the Cheyenne in implementing a commercial fish production facility using water reuse technology, a project supported by a donation to EWB - USA from Lockheed Martin. Previous efforts involved water projects in Honduras, Thailand and El Salvador.

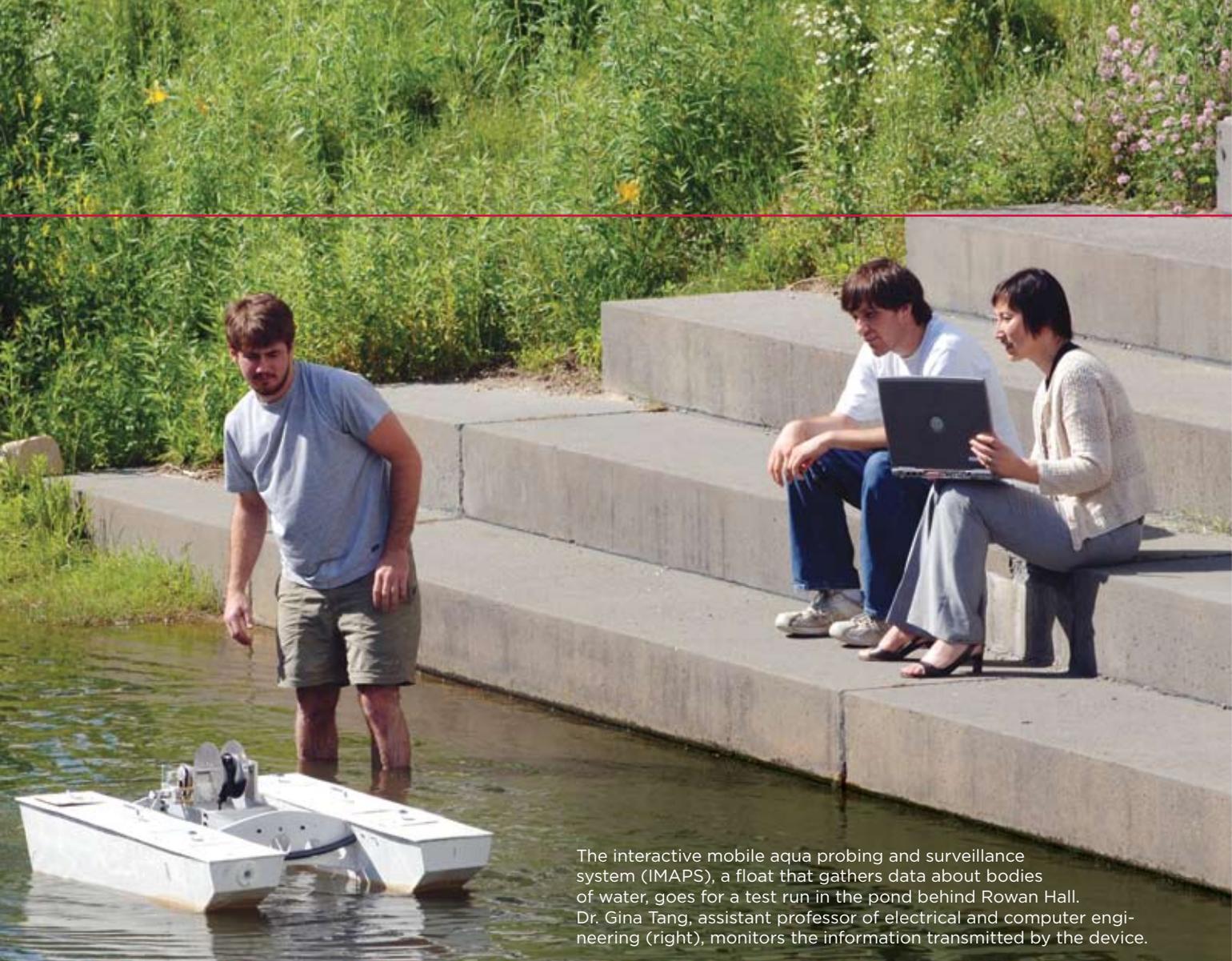
EWB - USA recently recognized the College’s community spirit with its annual Humanitarian Award. The \$1,000 gift accompanying the honor will help future efforts.

“It’s one thing to discuss dams and levees on campus, but it’s another to talk about them when working in a region where a flood wall actually failed.”

Dr. John Schmalzel, chair, Electrical and Computer Engineering

Engineers Without Borders - USA™ founder Dr. Bernard Amadei, professor of civil engineering at the University of Colorado at Boulder, spoke about the organization at the College of Engineering this spring.





The interactive mobile aqua probing and surveillance system (IMAPS), a float that gathers data about bodies of water, goes for a test run in the pond behind Rowan Hall. Dr. Gina Tang, assistant professor of electrical and computer engineering (right), monitors the information transmitted by the device.

ENTREPRENEUR

A Rowan Engineering education transcends the conventional, and many of the College's students also get a start on entrepreneurship, patents and their own businesses.

Rowan Engineering's entrepreneurial approach to education encourages students to develop their ideas beyond the classroom. This year, for example, engineering students teamed with others from the College of Liberal Arts & Sciences to construct an interactive mobile aqua probing and surveillance system (IMAPS), a sophisticated float that offers huge potential to gather data about rivers, ponds and estuarine bodies.

IMAPS is one of numerous devices created by students in the College's signature clinic sequence, including a patented guitar tuning peg, a snowboard-ski lift retrofit used on the slopes and a computer mouse-like writing aid, to name just a few.

With IMAPS, a conversation between Dr. Hong Zhang, assistant professor of mechanical engineering, and Dr. Patricia Mosto, interim associate provost and biology professor, sparked the undertaking. "Rowan does many interesting projects, and the synergy exists between different colleges to take ideas and turn them into reality," Mosto said. The colleagues discussed Zhang's underwater robot clinic, which then led to the concept of a similar device for water testing. As a result, the IMAPS endeavor took shape.

"A great deal of time and energy by biological, ecological and environmental researchers and educators is used on field trips to test water manually," Zhang said. IMAPS, which is now going through the patent process, may revolutionize this work.

"IMAPS is unique," said Dr. John Chen, associate professor and chair, Mechanical Engineering, "because anyone could have done it, but didn't. Rowan moved forward with it."

Dr. Hong Zhang, assistant professor of mechanical engineering (second from left), describes one of the probes that is part of the IMAPS.

URIAL



Known for collaboration between engineering disciplines and with other colleges, Rowan Engineering also extends that approach to education far from the University campus. The Federal Aviation Administration (FAA) and Rowan partnership, for example, continues to flourish with the addition of graduate-level engineering management courses taught by Rowan faculty at the agency's William J. Hughes Technical Center in Pomona, N.J. The classes join other FAA-Rowan initiatives, including airport pavement studies and technology commercialization.

Funded with \$450,000 from the National Aeronautics and Space Administration Education Fund and the U.S. Department of Education, classes in engineering optimization, Superpave asphalt technology and data fusion kicked off the program last fall. The courses address emerging technologies as well as research management challenges and are part of the College's graduate offerings.

"The program offers additional learning in how to manage projects and, at the same time, provides the opportunity to deliver a program at the FAA facility as well as build it on campus to meet a perceived need in industry," said Dr. Ralph Dusseau, professor and chair, Civil and Environmental Engineering. "Many engineers look for management roles at some point in their careers, and these courses will assist them in approaching potential employers."

The FAA is pleased with the connection. "The Technical Center enjoys an excellent working relationship with Rowan University," said former FAA Technical Center Director Dr. Anne Harlan. "The new graduate-level engineering courses offer a terrific opportunity to enhance our employees' scientific and engineering skills. Optimizing these skills is critical to retaining our position as one of the pre-eminent aviation research and development facilities in the world."

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Dr. Ralph Dusseau, professor and chair, Civil and Environmental Engineering

COLLABORATIVE



Rowan's collaboration with the FAA expanded this year to include courses taught at its William J. Hughes Technical Center in Pomona, N.J.

INNOVATIVE



Participants built LEGO® robots as part of the Engineering Clinics for Teachers program recently held at Rowan.

As part of a two-day workshop held at Rowan in June, South Jersey middle school teachers constructed brightly colored LEGO® robots. The purpose? To foster engineering education and ultimately to help build the United States' technical workforce.

Supported by a \$326,000 three-year grant from the Edison Venture Fund and jointly sponsored by the Colleges of Engineering and Education, Engineering Clinics for Teachers (ECT) will make engineering more relevant to teachers and help them integrate the subject into their existing curricula.

“Studies indicate the United States is lagging behind other developed countries in technology,” said Dr. Kauser Jahan, professor of civil and environmental engineering and ECT director. “Our goal is for Engineering Clinics for Teachers to serve as a model

for educating teachers who will support students considering the engineering field.”

ECT illustrates one way that the College of Engineering partners with educators, industry and government. Engineering teams consistently work with businesses on projects such as laser-based technology to help emergency personnel see through fog and smoke, and on drug development processes with major pharmaceutical companies.

In a broader public-private partnership for innovation, Rowan has broken ground for the first building at the South Jersey Technology Park at Rowan University. The Technology Park will facilitate science and technology initiatives and be a focal point for local economic growth.

Dr. Kathleen Sernak, College of Education (second from left), and Dr. Kauser Jahan, professor of civil and environmental engineering (third from right), work with a group of middle school educators during the June campus program intended to foster engineering education in area schools.



May 2005 Graduates:
95% began careers or graduate school.

In fall 2006, from a pool of 621 applicants, 140 students with an average SAT score of 1261 began their studies in the College of Engineering.

Graduate School

32% of the Class of 2005 attend such graduate schools as:

- Carnegie Mellon University
- Cornell University
- Drexel University
- Georgia Institute of Technology
- Harvard University
- Pennsylvania State University
- Rowan University
- Rutgers University
- University of Delaware
- University of Texas at Austin
- Virginia Polytechnic Institute and State University

Internships

In 2005-2006, Rowan Engineering students interned at such organizations as:

- Centocor
- ExxonMobil Corporation
- Delaware Department of Transportation
- Electric Mobility Corporation
- GE Energy
- Inductotherm Group
- Johnson Matthey
- L3 Communications
- Pennsylvania Department of Transportation
- Public Service Enterprise Group
- Schlumberger
- SONY DADC

ACCOMPLISHED

MESSAGE FROM THE CHAIRPERSON

DEAN'S ADVISORY COUNCIL

The Dean's Advisory Council consists of 15 men and women from large industries, small private firms and public service whose role includes supporting the College of Engineering, serving as a sounding board for the dean and introducing students to the work world.

Whether we support the College with our time, our abilities, our finances or a combination of these, we are proud to see the difference the College has made and is making for its students and for New Jersey. In this report you'll read about everything from collaborative relationships with government organizations and businesses to teams tackling alternative fuel work, from students and professors donating time through Engineers Without Borders - USA™ to the start of a new technology park.

While advisory council members come from various organizations and backgrounds, I think it is safe to say we volunteer for an overarching reason: we believe the College of Engineering offers an outstanding technical education that grooms its students to be the creators, innovators, entrepreneurs and leaders of tomorrow.

I am honored to be on an advisory council of a College that fulfills its mission so very well, and I am happy to donate my time to and see my company financially support its work.



Chet Dawson
Chairperson
Dean's Advisory Council
Director Site and
Environmental Engineering
Sony DADC Americas Region
Sony DADC





ENGINEERING EARNS HIGH RANKING

U.S. News & World Report continues to rank the College of Engineering a standout. From the 2006 to 2007 "Best Colleges" edition, Rowan jumped from 32nd to 20th among the nation's best undergraduate engineering programs whose highest degree is a bachelor's or master's. In the two most recent editions, the chemical engineering, mechanical engineering, civil engineering, and electrical and computer engineering programs have ranked as high as third, 10th, 11th and 14th in the nation, respectively.



College of Engineering

Henry M. Rowan Hall
201 Mullica Hill Road
Glassboro, NJ 08028
Phone: 856.256.5300
Fax: 856.256.5350

E-mail: engineering@rowan.edu
www.rowan.edu/engineering