

EngineeringNews



A MESSAGE FROM OUR DEAN

Rowan College of Engineering continues to have national impact, rising to 27th among similar institutions in the U.S. News & World Report college ratings, with Chemical Engineering placing fifth. While we are careful not to confuse media rankings with quality, we are confident we offer a premier educational experience for engineers. It is thrilling to see this reflected by our peers, as our students and faculty take pride in their efforts.

This continues to be a fiscally challenging time for higher education. Fortunately, the engineering clinics are a mainstay for the College, and business values the return on investment that Rowan Engineering provides. As we constantly assess our products and processes for improvement, we have also reviewed this newsletter. With this issue, we are providing a more efficient and accessible format for highlights and features. Please feel free to contact us for further information about faculty, students or clinic projects.

We hope you enjoy the issue and share in our enthusiasm for Rowan Engineering as we continue to flourish.

Regards,
Dianne Dorland, Dean
College of Engineering

U.S. News Gives Rowan Engineering High Marks

U.S. News & World Report this fall ranked Rowan University's Chemical Engineering program fifth among similar programs across the nation. In the latest edition of "America's Best Colleges," Rowan's Chemical Engineering program compared favorably with the best undergraduate programs in the nation at colleges and universities that primarily offer bachelor's or master's degrees. Rowan's Civil & Environmental Engineering program ranked 11th in this group.

Less than a decade old, Rowan's College of Engineering, which also offers bachelor's and master's degrees in Electrical & Computer Engineering and in Mechanical Engineering, ranked 27th among similar institutions.

Today 450 students are enrolled in the College, which offers a novel approach to engineering education that revolves around key hallmarks (see box). Central to that approach is the multi-disciplinary clinic sequence, providing an opportunity for students from freshman year on to gain hands-on laboratory and project experience that complements coursework. Throughout their academic careers, undergraduate and graduate students have an opportunity to work with others from all disciplines and to undertake cutting-edge research with professors, many of whom are leaders in their fields.

Administrators are honored by the acknowledgment the College received from leaders in engineering education who voted on the U.S. News rankings.

"We're pleased with this recognition," said Dean Dianne Dorland. "I know the work our professors and students do on campus. Their research, presentations, publications and involvement in professional organizations all contribute to the quality of our College and the perception others have of it."



Chemical Engineering students gain experience in the lab.



Rowan Engineering Hallmarks

The College of Engineering designed a set of hallmarks that provides a blueprint for the classroom, laboratory and clinic experiences. These seven unique and identifying characteristics support the goals of each of the four engineering disciplines.

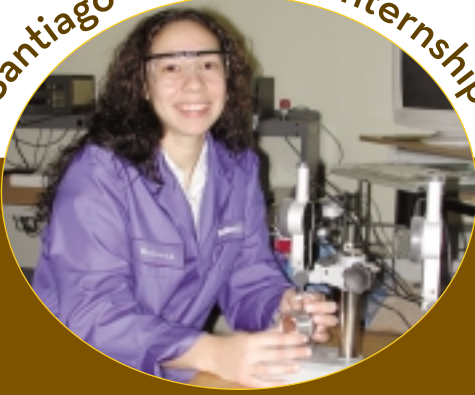
They call for experiences that are:

- Multi-disciplinary
- Hands-on
- Entrepreneurial
- Teamwork-Oriented
- Integrated
- Contextual (Engineering in the broader context of society and environment)

And that will create:

- Capable Communicators

Santiago Soars with Internship



Rebecca Santiago's (ChE '03) internship with Schlumberger took off with a bang. Not literally, of course, but Santiago's internship in Texas with the global oil field and information services company proved to be an excellent learning experience, the type many Rowan Engineering students have enjoyed with firms in the region and beyond.

At Schlumberger, Santiago learned about explosive devices used to perforate oil wells. She learned about manufacturing shaped charges used in oil well perforating. And she learned about the exacting precision and quality control that make Schlumberger a leader in the oil field services industry.

"I was working at one of the company's product centers. I immediately realized that my course in experimental design would be very useful," said Santiago, who developed statistical process control methodology for one of Schlumberger's high-temperature boosters. "It was exciting to take the basic concepts that I learned in class and apply them to my work."

Santiago's supervisor, Senior Chemical Engineer Philip Kneisl, said Santiago confirmed his belief that Rowan Engineering turns out "superior graduates" and praised her communication skills, problem-solving skills, flexibility, and contributions to a multidisciplinary team. "More importantly," Kneisl said, "Rebecca demonstrated her ability to learn and adapt."

Those traits helped Santiago land full-time employment at Schlumberger's product center in Rosharon, TX, as a chemical engineer. Santiago now works with a team of product designers developing perforating guns. Currently she is updating the company's product catalog and learning the different aspects of product development, according to Kneisl.

Melanie Basantis, Rowan Engineering's outreach director, said, "Rebecca's experience at Schlumberger was wonderful but not unique. Our students are gaining valuable experience in business and government facilities in many areas. They enter those internships with the education and training that make them highly competitive, and frequently they leave with a job waiting for them."

College Offers Digital Imaging across the Curriculum

A recent \$75,000 grant from the National Science Foundation (NSF) will help enable Rowan Engineering to integrate digital imaging technology throughout its curriculum, a move that is unique among engineering programs.

The three-year Course, Curriculum, and Laboratory Improvement grant will partially fund an educational research effort to incorporate digital imaging techniques in Rowan's Chemical, Civil & Environmental, Electrical & Computer, and Mechanical Engineering programs. Rowan will provide \$145,000 in matching funds and resources for a multidisciplinary team of 10 faculty members to collaborate on developing new techniques and hands-on experiences for students, establishing a model for engineering education across the nation.



While other institutions use digital imaging technology, it is rare for schools to use it at all levels and collaboratively among all departments. Digital imaging technologies usually are introduced in physics or electrical engineering curricula and generally at the graduate school level, noted John Chen, Mechanical Engineering department chair.

Civil & Environmental Engineering Professor Kauser Jahan, principal investigator for the project, said the faculty takes a major interest in creating innovative educational practices, and Rowan Engineering provides an excellent vehicle to establish new methodologies.

"We're already set up to integrate multidisciplinary concepts. Many of our courses are team-taught. We also have a good inventory of equipment," Jahan said. "Students from one of our Junior/Senior Clinic teams will develop nine hands-on experiences that will be integrated into our four-year clinic sequence and into specific courses."

The technology will have many applications. "Digital imaging technology, in the sense that we're using it, is a broad class of devices, such as microscopes, high-resolution scanners and thermal imaging cameras, that produces a digital image or sequence of images as its product," Chen said. "The major benefits of digital images are they can be reproduced an unlimited number of times without deterioration in quality, are easily and efficiently stored, can be readily manipulated using a computer and can be easily analyzed using a computer to aid in decision making or for engineering calculations."

“ PAC benefits from faculty expertise. The students benefit from the opportunity to learn inspection techniques and be able to integrate them into the virtual reality system. They also get the chance to visit our facility in Princeton Junction on a regular basis to utilize our equipment and tap into the knowledge of our research engineers and scientists. These collaborations have resulted in a strong bond between Rowan Engineering and PAC. ”

Dr. Ronnie Miller
Executive Director of Engineering Services & Inspection
Physical Acoustics Corporation

Engineering Students Working to Preserve Pipelines

Donning dark glasses, students crowd in front of a four-by-six-foot video screen, ready for their mission. With precision, they swerve and dip through rounded curves and tight spaces. Using a control box, they maneuver above and beneath the earth's surface.

This is no game. The students are in the College of Engineering at Rowan University, and the screen they are facing is part of a virtual reality system that displays three-dimensional views of natural gas pipelines.

The students are working with several professors to design a system that will revolutionize the process of pipeline inspection. While methods exist to inspect the pipelines – including running a “pig,” or self-propelled piece of equipment, that travels through pipelines and uses magnetic imaging and ultrasound to detect problems – professionals in industry and government are looking for ways to improve their efforts to keep the infrastructure safe.

In addition to using virtual reality, the Rowan team is employing artificial intelligence, data fusion, environmental models, geographic information systems, and other technologies to create a virtual map of natural gas transmission pipelines and a detection system that will pinpoint defects in the pipelines.

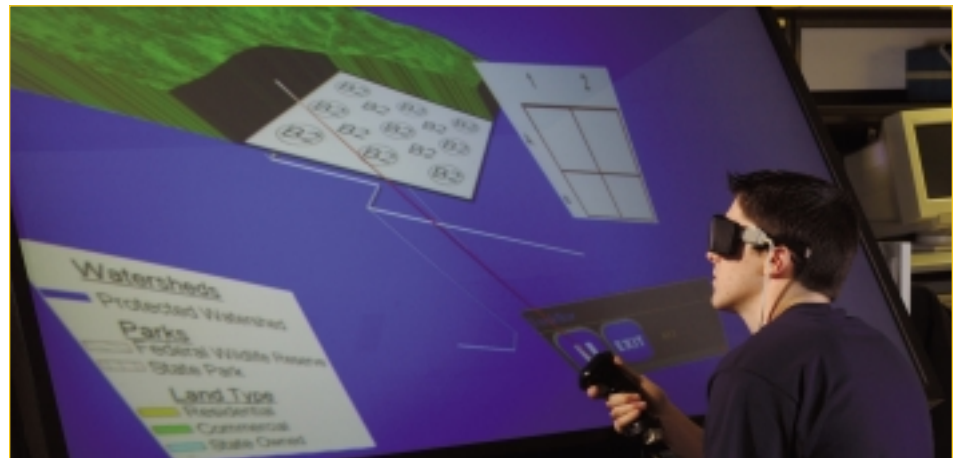
The students' work eventually may help protect 180,000 miles of U.S. pipeline, and it is serious business: the U.S. Department of Energy, the NSF and ExxonMobil contributed \$500,000 to fund the project. To date, the Rowan Engineering team is the only student group in the country working on this specific project.

The pipeline effort is part of Rowan Engineering's signature hands-on Engineering clinic sequence, which brings undergraduate and graduate stu-

dents from multiple disciplines together to tackle a project. The pipeline team includes students and faculty from Electrical & Computer Engineering, Mechanical Engineering and Civil & Environmental Engineering who are using ultrasound, magnetic imaging, acoustic imaging and thermal imaging to test a section of pipeline that simulates actual pressurized gas pipelines. The students then feed data into an artificial intelligence system to determine the

visit our facility in Princeton Junction on a regular basis to utilize our equipment and tap into the knowledge of our research engineers and scientists. These collaborations have resulted in a strong bond between Rowan Engineering and PAC,” said Dr. Ronnie Miller, executive director of Engineering Services & Inspection at PAC.

The project coordinators expect the students will be able to help professionals in the pipeline industry design new



Rowan Engineering students are using a virtual reality system to map sections of pipeline and “travel” through the line to view the condition of the pipe and pinpoint the geographic location of any defects.

condition of the pipe and, if it is defective, assess the severity of the fault.

The team is collaborating with Physical Acoustics Corporation (PAC), Princeton Junction, NJ, a firm that manufactures non-destructive testing equipment. Rowan students are working on campus and at the firm with PAC engineers, which is helping the students learn where their work fits into engineering practices in industry.

The collaboration provides many advantages. “PAC benefits from faculty expertise. The students benefit from the opportunity to learn inspection techniques and be able to integrate them into the virtual reality system. They also get the chance to

systems or remediate existing systems, said Electrical & Computer Engineering Professor Shreekanth Mandayam, principal investigator for the project.

The ultimate success of the pipeline project – which has spawned interest in other Rowan virtual reality collaborations – will be measured over time, but the benefits of this clinic experience to the students already are evident.

“There is a synergy between graduate and undergraduate students,” Mandayam said. “There is a seamless integration of technology with theory. There is an appreciation of the skill sets of a multidisciplinary team. And there is an understanding of the societal impact of their efforts.”

NSF Presents ECE Prof a Top Award

The National Science Foundation recently presented Rowan Electrical & Computer Engineering Professor Robi Polikar one of the most prestigious awards it offers, a Faculty Early Career (CAREER) Development Award for junior faculty members. The CAREER Award, the first ever received by a Rowan faculty member, acknowledges and supports the early career-development activities of teacher-scholars the NSF believes will become the academic leaders of this century.



The award includes a \$400,000 grant, which Polikar will use for a five-year project integrating his research and education efforts in the field of incremental learning, work geared toward creating a new generation of computers that could actually learn new information without forgetting existing knowledge.

Polikar explained that today's computers are taught to interpret certain bundles of information. "What if new information becomes available?" Polikar said he asks his students. "We will look at ways to make machines learn, or evolve in time, as new information becomes available. We hope to improve the capabilities of the computers without letting them 'forget' what they already know."

Polikar believes there are many uses for computers that can learn incrementally, such as recognizing EEG signals to help diagnose Alzheimer's disease.

He is grateful for the NSF funding. "The CAREER Award allows educators to remove the artificial separations that exist between research and education," Polikar said. "I believe that only when we combine them do we really provide an education."

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