NM STATE UNIVERSITY

2005-2006: Highlights of the Year

College of Engineering

New Mexico State University
College of Engineering: Strategic Plan

Mission

The College of Engineering will uphold the land-grant mission of NMSU through nationally recognized programs in education, research and professional and public service.

Vision

By 2015, the College of Engineering at NMSU will rank among the top 25 public engineering programs in the United States in teaching, research and service.

Goal 1:

To be nationally and internationally recognized for academic and research programs in engineering and engineering technology.

Goal 2:

To provide excellent engineers and engineering technologists for industrial, government and academic constituents of the College of Engineering.

Goal 3:

To be the university of choice for undergraduate engineering and engineering technology education in the region.

Goal 4:

To serve as an engine for economic development in New Mexico through the advancement of engineering and technology.

A Message from the Dean

Great things are happening at the College of Engineering at NMSU

Research activity grew almost one million dollars from the previous fiscal year. Our gifts have increased substantially. In addition to the largest in-kind corporate contribution ever received by NMSU from Partners for the Advancement of Collaborative Engineering Education (PACE) with an educational sales value of $88 million, gifts to the college increased $2.5 million over the previous fiscal year. And while enrollment for the past year is somewhat down, in line with a nationwide trend over recent years, the preliminary numbers for 2006-2007 appear to be up considerably.

At the same time, the college continues to grow in national stature for its effectiveness in graduating students from an ethnically diverse population. Some 39 percent of students in the college are Hispanic and we are ranked fifth in the nation for graduating Hispanic students, and sixth when it comes to Native American students. Our commitment to offer a top-notch engineering education to the people of New Mexico crosses all cultural, ethnic and geographic lines.

Our students are graduating with fulfilling and lucrative job offers in hand. The fact that we had approximately100 recruiters seeking our 300 plus graduates this past year is indicative of the demand for our highly trained and ethnically diverse students.

This level of success is the result of a dynamic program that we strive to continually improve and adapt to the changing needs of employers. Such an example is the aerospace engineering program that was launched in fall 2005. Another example is the information communication program that was begun the previous year and was one of the fastest growing degree programs on campus.

Outstanding faculty members are the foundation of the college. They foster our student success through their own research activities and accessibility to all students. This past year we added one new endowed chair, three new endowed professorships and one endowed graduate assistantship. This level of support enables us to attract and retain the very best faculty.

Driving our success is a new strategic plan that focuses on establishing the College of Engineering into the top 25 public engineering programs by 2015. The plan focuses on national recognition, production of exceptional graduates and development of leading-edge technologies through strong research programs.

We are grateful to our many supporters for making these things possible. Our partnerships with individuals and corporations continue to grow, thereby providing many new opportunities for our faculty and students. It's a wonderful endorsement to be worthy of such generous investments in our program.

The following pages reflect the nature and makeup of our college. I hope you enjoy reading about some of our successes. It truly has been a great year for the college and we are poised to have more achievements in the years to come.

Sincerely,

Steven P. Castillo
Dean, College of Engineering
NMSU Regents Professor

College Profile

Degrees Offered

Aerospace Engineering (B.S. with M.S. and Ph.D. pending approval)
Chemical Engineering (B.S., M.S., Ph.D.)
Civil Engineering (B.S., M.S., Ph.D.)
Electrical and Computer Engineering (B.S., M.S., Ph.D.)
Engineering Physics (B.S.)
Engineering Technology (B.S., with emphasis in civil, electronics and computer, or mechanical)
Industrial Engineering (B.S., M.S., Ph.D.)
Information and Communication Technology (Bachelor's degree)
Mechanical Engineering (B.S., M.S., Ph.D.)
Surveying Engineering (B.S.)

Staff (2005-2006)

Tenured Faculty 49
Tenure-Track Faculty 19
National Science Foundation Career Awardees 7
Endowed Chairs 3
Endowed Professorships 12
Research Faculty and Staff 28

Accreditation

The chemical, civil, electrical and computer, industrial, mechanical and surveying engineering programs are accredited by the Engineering Accreditation Commission of ABET. The engineering technology programs in civil, electronics and computer and mechanical engineering are accredited by the Technology Accreditation Commission of ABET.

111 Market Place, Suite 1050
Baltimore, MD 21202-4012
(410) 347-7700

Research Centers

Bridge Inspection Program
Ken White, director
For more than 25 years, NMSU has researched techniques to solve technological problems with bridge systems. The Bridge Inspection Program is an important resource for bridge evaluation, bridge inspection training, smart-bridge technology and broad-based research and development.

Center for Space Telemetering and Telecommunications
Stephen Horan, director
NMSU was designated as a Telemetering Center of Excellence by the International Foundation for Telemetering to conduct the study of telemetry systems, advanced communications, advanced modulation, coding, data transport and equalization techniques.

Institute for Energy and the Environment
Abbas Ghassemi, director
The IEE is the focal point for the college's faculty-based research and outreach in water, energy and the environment. It serves as an umbrella to several programs that are primarily sponsored by the U.S. Department of Energy.

Carlsbad Environmental Monitoring and Research Center
James Conca, director
Established in 1991, CEMRC conducts environmental research, provides specialized analytical services and technology development, and disseminates information for federal, state and private sponsors.

Southwest Technology Development Institute
Andrew Rosenthal, assistant director
The Southwest Technology Development Institute was established in 1977 as an applied research and development center for renewable energy technologies. It is recognized for its engineering research in energy and environmental systems.

WERC: A Consortium for Environmental Education and Technology Development
Abbas Ghassemi, director
WERC's mission is to develop human resources and technologies to address environmental and human-health related issues through education, public outreach and technology development.

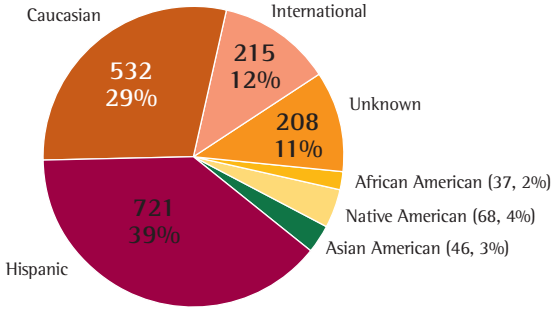
Manufacturing Technology and Engineering Center,
Anthony Hyde, director
M-TEC supports economic development in New Mexico by providing quality education, engineering, technical and other extension services to constituents both internal to NMSU as well as throughout the state.

Enrollment

Enrollment	Fall 2004	Fall 2005
Total College Enrollment	1,955	1,827
Undergraduate Enrollment	1,579	1,463
Graduate Enrollment	376	364
Female	337	337
Male	1,618	1,490

Graduates	2004-2005	2005-2006
Bachelor's Degrees	248	215
Master's Degrees	77	106
Doctoral Degrees	8	6

Fall 2006 Student Ethnic Breakdown



Total: 1,827

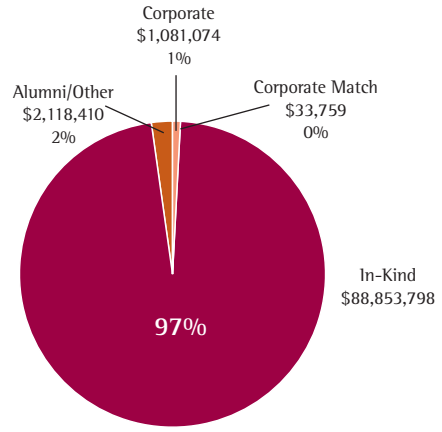
Endowments

	2004/2005	2005/2006
College/Department Endowments	$405,497	$489,535
Chair/Professorship Endowments	$3,231,459	$5,319,762
Building/Equipment Endowments	$13,664	$13,664
Scholarship Endowments	$7,868,725	$8,420,225
Research Endowments	$226,050	$227,133
Total Endowments	$11,745,394	$14,290,339

Scholarships

Number of Scholarships Awarded	249
Total Scholarships Awarded	$349,238
Average GPA of Scholarship Recipients	3.13
Average Scholarship Award	$804

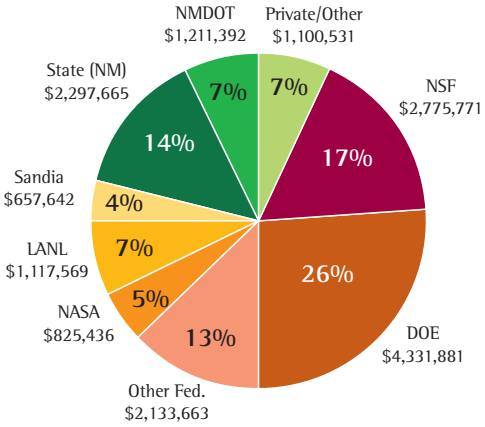
Gifts



Total 05/06 Gifts: $92.1 million

Research

	2004/2005	2005/2006
Research Expenditures	$15,545,396	$16,451,490
New Awards or Renewals (240)	$17,696,386	$16,859,049
Proposals Submitted	196	211



Total 05/06 Research Expenditures: $16,541,490

Electrical engineering students Brian Duenas, center, and Lee Finley, right, and Professor Stephen Horan work on the latest nanosatellite project.

Research Highlights

Small satellites hold big potential

Small is big when it comes to next-generation satellites.

Compact and lightweight, nanosatellites are easier and less expensive to launch into orbit than traditional satellites. It's like pushing a microwave oven into space instead of a minivan.

But the little satellites' potential is large. Faculty and students at NMSU are in the initial stages of designing and building a small satellite with a robotic arm that could be used – for instance – to grab and dock with another satellite for servicing.

As the X Prize Cup competition draws aerospace entrepreneurs to southern New Mexico and the Southwest Regional Spaceport being developed north of Las Cruces, the possibilities for putting small satellites and other student-built payloads into space grow more interesting.

"My vision is to have a stable of student-built payloads here at NMSU" that could fly on rockets and space planes to be launched from the spaceport, said Stephen Horan, head of NMSU's Klipsch School of Electrical and Computer Engineering.

Horan said the university can develop the capabilities for testing, preparing and repairing, payloads built by others for launching at the spaceport.

NMSU's involvement in the nanosatellite arena began a few years ago when the university teamed with the University of Colorado and Arizona State University on an Air Force-funded project to design and build three nanosatellites that would fly in a constellation. This Three-Corner Satellite Project was designed to use digital cameras to capture stereo images of cloud formations. NMSU designed and built the communications system to test the capabilities of inexpensive, commercial-grade components in space. Three-Corner Sat was launched in late 2004, but the rocket under-performed and the satellites never made it into orbit.

The university's next nanosatellite project was an all-NMSU venture with a scientific payload important to NASA's program to search for ultra-high-energy cosmic rays. The cosmic-ray satellite was also funded by the Air Force in its highly competitive university nanosatellite program, but it was not selected for launching.

The current project, with the goal of developing a satellite with a robotic arm, is being tackled in stages.

"The plan is to build a succession of satellites where each one is more sophisticated than the previous one," Associate Professor Steven Stochaj said. "The first stage is to figure out a way to stabilize it so it isn't just tumbling through space." Senior-level electrical engineering students in a "capstone" design course are working on the stability issue and mechanical engineering Professor Ou Ma, an expert in robotics, is leading the development of the robotic arm.

Nature may provide secrets to unmanned flight

In NMSU's mechanical engineering undergraduate fluids lab, a bright red model bird in a small wind tunnel flaps its wings as though in continuous flight through the smoky environment. Students monitor the patterns created in the smoke flow by the undulating movement. This is one of several research projects that involve the study of nature's best flyers, and swimmers, to adapt their perfection to man-made vehicles.

The study, supervised by mechanical engineering Professor James Allen, is the result of a grant from the Air Force Office of Scientific Research to further its quest for small, unmanned aerial vehicles (UAV's). Allen believes the information gathered from this study could be useful in designing such craft.

"We know the bird, a flexible foil, creates thrust. We're after the measurable particulars: how much speed, frequency, and also important, the drag," explains Jake Harlow, a mechanical engineering graduate student participating in the study.

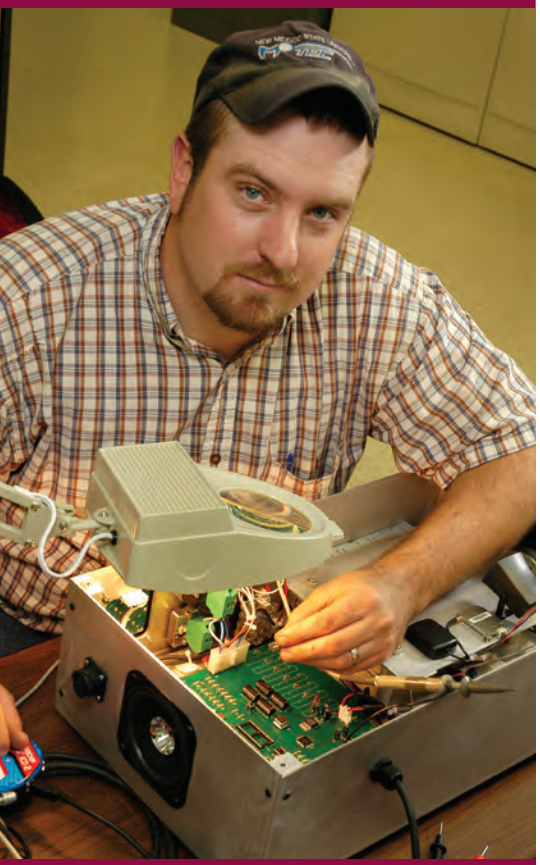
Important parameters in this research include the geometry and flapping motion of the bird and the properties of the air flow in the wind tunnel. Outcomes to be measured include flow properties over and downstream of the flapping wings, especially the vortex pattern that develops. The smoke makes the vortices visible and will allow measurement of speed and vortex shedding frequency by a laser and high-speed camera device. The optics capabilities make it possible to see what occurs in the minute interval between exposures. Study of these flow properties will enable a better understanding of the mechanisms that allow birds to generate thrust so efficiently.

Harlow spent the earlier stage of the project designing and testing the setup until it was a feasible method for gathering data. Plans call for the addition of two more smoke sources before starting the systematic testing with the laser and camera at various settings.

Smoke patterns show vortices created by the flapping wings of a mechanical bird that may lead to improved performance of unmanned aerial vehicles.

The smoke is created with oil dropping onto a heated wire while the wind tunnel creates air current.

Additional experimentation related to this project will be conducted with the observation of hummingbirds in flight. They will also conduct tests in a water tunnel using structures that mimic fish.



Ryan Herbon, a chief engineer with NMSU's M-TEC, works on a model of a PaceIgnitions' product at a lab on the university campus.

NMSU guides PaceIgnitions from concept to venture capital

Parents may soon gain remote control over teenage driving habits thanks to new technology that start-up company PaceIgnitions has developed with help from NMSU.

The technology, which allows parents to program the speed, time of day and places that teenagers can drive, among other features, was showcased at a May 2006 venture capital symposium in Albuquerque organized by Technology Ventures Corp. (TVC).

This is the first time a company that received NMSU guidance from drawing board to finished product has been accepted for review at TVC's annual symposium.

Every year, the gathering attracts dozens of investors looking to finance new technology start-ups. PaceIgnitions owner Mike Phelan has already patented his idea, but last year he requested help from NMSU's Manufacturing Technology and Engineering Center (M-TEC) to mold his initial concept into a functional retail product.

M-TEC engineers and research assistants spent months writing complicated software that allows parents to program driving rules and regulations for teenagers on home computers. Once programmed, the data is uploaded to a receiving box installed on a car's dashboard. Global Positioning Systems are used to alert teenagers whenever they break the rules, said Ryan Herbon, an M-TEC design engineer.

"If they drive above the speed limit, forget to wear their seatbelt or drive outside an agreed-upon radius, the device will automatically sound an alarm, toggle the dome lights and turn off the radio until the teenager corrects the violation," Herbon said. "If it's past curfew, the teenager won't even be able to start the car."

The receiver box, which M-TEC staff designed in manufacturing labs at NMSU's College of Engineering, is slightly larger than an adult hand and works on all cars regardless of make and model. It has a key pad on the front to enter individual codes for up to 10 different drivers. That will free parents and other adults from the rules and regulations programmed for teenagers, Herbon said. The device will record all driving habits, allowing parents to review a teen's record on home computers.

"If the teen went above the speed limit, jammed on the brakes or accelerated very fast, parents will see it on the report," Herbon said.

NMSU's Arrowhead Center, which provides low-cost consulting and assistance services for new and existing businesses, conducted an Internet-based consumer survey to determine the potential market for PaceIgnitions. The survey confirmed consumer interest and willingness to pay about $400 to purchase and install the product.

Phelan paid about $15,000 for Arrowhead and M-TEC services, compared with about $500,000 he says commercial consultants would have charged.

"NMSU provided hundreds of thousands of dollars worth of engineering services, market analysis and consumer research," Phelan said. "Without them it would have taken many, many years to get where I am now."

Researchers developing ultra-thin, electronic 'nano skin'

Picture this: a television with a screen that is so thin, flexible and portable that you can hang it on the wall or hold it in your lap, watch a program, then roll it up and take it with you when you leave. The day's newspaper could be a single sheet of electronic paper that displays pages, one-by-one, as you scroll through. A stack of self-stick notes could be replaced by one note, which could be electronically updated over and over again with new tasks or reminders, rather than being thrown away.

The building blocks for these and other potential applications are based on "nano skin," an ultra-thin array of nanotubes encased in a flexible polymer film that is being developed by a group of researchers from NMSU and other institutions.

NMSU graduate student Jamal Talla, left, and Seamus Curran, an assistant professor of physics, discuss research in nanotechnology.

In nanotechnology, the science of building materials one atom at a time, nanotubes are tiny elongated cylindrical carbon structures consisting of hexagonal graphite molecules attached at the edges.

Seamus Curran, an assistant professor of physics and an adjunct faculty member in chemical engineering at NMSU, came up with the idea to create nano skin about three years ago when he was at Rensselaer Polytechnic Institute in New York. "I had a thought, even at that stage, that it might be possible, by using composite formation, to make an effective field emission device," Curran said. "I didn't expect it to be as great a success as it actually was. I thought it was going to work, but I didn't think it was going to work great."

New Mexico State University is the only school in New Mexico to offer degrees in aerospace engineering, surveying engineering, industrial engineering and engineering physics.

Curran and Aditya Avadhanula, a graduate student in chemical engineering at NMSU, worked with scientists at Rensselaer and Northwestern University to turn the idea into reality. Their results were published in the journal Nano Letters in March 2006.

The technology has many advantages. Nanotubes can be set up in any configuration, which is retained after the polymer is added. The nano skin is flexible, has the ability to conduct electricity, and can be stretched or compressed.

Nano skin could be used to measure stress in a building by being imbedded in a wall or other structural element to sense any movement or imperfections. The material could be used as a gas sensor or as a field emission device for a flexible, flat-panel display. Curran said his group's nano skin technique provides the highest field emission intensity when compared with any other nanotube system.

"It's very significant for the field of nanotubes because it brings nanotubes one step closer to application. I think it's very important technologically because you're now looking at a flat-panel display potentially," said Curran.

Curran's next step is to look at channeling emissions and the use of color. "There are some physics to be sorted out in my head first before I can actually build it. So I have to reason it out for myself, where to go next," he said.

Virtual reality could lead to better, less-expensive satellites

Research conducted at NMSU could help make future satellites better – and at less cost.

One of the keys is harnessing the power of virtual reality to analyze proposed satellite designs.

"Typically, companies make a prototype that costs several millions of dollars," said Joe Cecil, assistant professor of industrial engineering at NMSU. "Then they make changes and go back and forth, which lengthens the time it takes to manufacture and launch a satellite and again increases the overall cost substantially."

With virtual reality, Cecil explains, engineers can evaluate some aspects of a design before any money is spent on building an actual model.

Cecil and student researchers at NMSU have been working on a virtual-reality environment to assist with satellite designs, especially studying their feasibility from an assembly perspective. They developed software modules to perform assembly oriented analysis as well as other tasks such as allowing engineers to perform "virtual walk-throughs" using motion trackers and eyewear. Virtual-reality eyewear connected to the computer allows users to perceive depth.

The result is an environment that allows engineers to evaluate candidate satellite designs or understand which design may be easier to assemble. New evaluation modules can be linked to the virtual environment to incorporate additional evaluation criteria from experts who want to propose new assembly methods.

Cecil notes, however, that it is not possible to simulate all engineering tasks. "Collaborative research among engineers and scientists from various disciplines is crucial to be able to achieve this," he said.

Cecil and his students began by developing preliminary measures to compare different satellite designs, especially from a manufacturing perspective. In the long term, he said, such an approach would enable NASA and other space engineering organizations to decide between different designs on a project.

In general, Cecil said, the use of virtual approaches in industries such as automobile manufacturing and aircraft assembly has the potential to reduce the overall cost of product development by 20 percent to 40 percent.

In addition to the satellite project, Cecil and his students are developing virtual-reality modules that could be used in environments such as micro assembly, nano assembly and the assembly of printed circuit boards. Unique to this research is the emphasis on an emerging area called 'information-based manufacturing." The new Center for Information Based Modeling at NMSU is the first of its kind worldwide and is collaborating with Sandia National Laboratories and NASA's Johnson Space Center, as well as universities in Mexico and India, on a variety of research and educational initiatives.

NMSU is one of only a handful of universities in the country that teach industrial engineering principles and concepts related to the creation of virtual reality-based environments.

"Industry has told us they want this to happen," Cecil said.

Industrial engineering Professor Joe Cecil (left) works with graduate student Gobinath Narayanasamy.

New water purification process saves energy and money

Shuguang Deng, NMSU assistant professor of chemical engineering, examines solar panels with Prajwal Vikram, chemical engineering graduate student.

The shortage of fresh water in the nation is becoming an increasingly important challenge that will significantly affect economic development and the daily lives of people.

The good news is that New Mexico has large amounts of brackish, or salty, water that can be treated to add to the fresh water supply. New technologies are being invented to deal with this issue; older technologies are being refined. The goal: to desalinate New Mexico's saltwater, thus providing a fresh water supply for residential, agricultural and industrial uses.

Shuguang Deng, an assistant professor of chemical engineering at NMSU is addressing this issue by combining solar energy and a process called membrane distillation to remove salt from water.

"What we are doing is very important because it has large implications for New Mexico as well as the nation," Deng said. "We need fresh water to meet the demands of our increasing population. By combining the abundance of brackish water and solar energy in this state, New Mexico is an ideal place to test the system. By doing so, we will be able to provide fresh water at the lowest possible cost."

While reverse osmosis is more cost-effective than most current technologies for treating brackish water with low salinity, Deng said it cannot be used to treat water with high salinity because of the extreme high pressure needed.

Another technology, thermal distillation, uses energy to boil water, thus creating water vapor and leaving impurities behind. However, this process requires a lot of energy and is therefore not cost-effective, Deng said.

Deng's process of membrane distillation involves transporting water vapor through a membrane. The membrane is hydrophobic, so it does not let water in its liquid form pass through. On one side of the membrane, the sun heats the water to create water vapor, which passes through the membrane, leaving the salts behind. As condensation occurs at a cooler temperature on the other side of the membrane, the vapor then reverts to its liquid form.

By combining the advantages of membrane process and thermal distillation into the membrane distillation, high-quality fresh water is produced while energy costs are reduced.

The pilot testing of Deng's process was scheduled to take place at the Tularosa Basin National Desalination Research Facility near Alamogordo. However, Deng said the research facility is not yet ready to test his membrane distillation process, so the pilot test will take place at NMSU instead.

The salinity of NMSU's water – about 1,000 parts per million total dissolved solids – is less brackish than the Tularosa Basin groundwater, but Deng says he will compensate for this by adding enough salt to mimic the Tularosa Basin groundwater.

New Mexico State University is home to the oldest College of Engineering in New Mexico.

Researchers field-test technology for converting biomass into energy

NMSU researchers have teamed with Sierra Vista Growers and regional dairy farms to field-test an anaerobic digestion technology to convert cow manure into methane that can be used to generate electricity.

New Mexico's dairy industry is the largest cash-producing agricultural commodity in the state with an economic impact estimated at $2.1 billion annually. However, the industry faces a big challenge in disposing of a high volume of waste in an environmentally and economically sound manner. The estimated 330,000 dairy cows in New Mexico produce almost eight million tons of wet manure waste annually.

Researchers from the NMSU College of Engineering and WERC: A Consortium for Environmental Education and Technology Development are developing a system that uses an anaerobic bio-digester to turn manure into energy and useful byproducts.

The project is supported by the State Technologies Advancement Collective (STAC), through the New Mexico Energy, Minerals, and Natural Resources Department and the Texas Energy Commission.

An anaerobic bio-digester is a mechanical system that decomposes organic matter, in this case manure, to produce methane that can in turn produce electricity and byproducts such as potting media and soil amendments that are better than commercial-grade fertilizer.

WERC Associate Director George Mulholland and civil engineering professors Zohrab Samani and Adrian Hanson are evaluating the pilot-scale system.

"What we're doing is gathering good quantitative data we hope will show that this process will be both an economic plus for the dairy industry and will help to solve the environmental issues associated with disposing of dairy cattle waste," Mulholland said.

"The conversion process consists of three solid-phase reactors that will produce methane," said Hanson. "A six-kilowatt generator will be used to produce electric energy and approximately 60,000 British thermal units (BTU) per hour of thermal energy. The electrical output will be enough to sustain up to four dwellings."

Natural gas consists of about 90 percent methane, yielding a BTU/cubic foot value of about 1,000. Biogas is 55 to 65 percent methane, 30 to 35 percent carbon dioxide, with some hydrogen sulfide, nitrogen, and traces of other gases. Its heating value is around 600 BTU per cubic foot.

The potential exists to produce up to 50 megawatts of electrical output. The closed-system technology for treating dairy manure works especially well in arid climates like New Mexico's because it does not require much water.

Steven Moates, WERC technician, prepares to post a sign for the next phase of a bio-energy research project at Sierra Vista Growers in Vado, N.M. In the background is a biodigester that turns manure into energy and useful byproducts.

The College of Engineering at NMSU was selected to be the first Telemetering Center of Excellence in the United States by the International Foundation for Telemetering.

Surveying students help BLM modernize records

Surveying engineering students at NMSU are getting the chance to expand their knowledge and gain valuable experience through a partnership between the U.S. Department of the Interior Bureau of Land Management (BLM) and the surveying engineering program.

The BLM initiated the Geographic Coordinate Data Base project for the entire nation in 1989 to convert hard copy public lands survey system records into modernized digital data and bring them all into one database.

In 2003, the BLM established a five-year partnership with NMSU to update the records for New Mexico. Since then, 14 students have worked on the project for at least one semester. Four of those students have begun their professional careers with the BLM and two more are planning to do so as well upon graduation, said Kurt Wurm, assistant professor of surveying engineering and principal investigator for the project.

Students participating in the project work with a wide variety of land survey records, gaining experience that might otherwise take years to accumulate. They also learn efficient handling of digital land surveying data and are exposed to the surveyor's role in the development and use of land information systems.

"We're finalizing data that covers much of the Gila National Forest. Previously, we've worked on data in support of a Homeland Security project in the San Juan River basin as well as the Navajo and Zuni reservations in the northwest," Wurm said.

As a result of the project, computer software has been created that makes it possible to use the spatial data collected, Wurm said. Specifically, the software provides for data visualization using Google Earth and other popular desktop mapping software. It also transforms the data into a format usable in the field with a handheld Global Positioning System.

"This has been a great tool for federal land managers as well as the professional surveying community," Wurm said. "This software is now widely used in the undergraduate program in surveying engineering as well as in the professional arena throughout the western US."

The project has also resulted in a series of seminars for professional surveyors on the appropriate uses of this technology to assist in field surveys and to facilitate recovery of historical land markers, Wurm said. A seminar hosted at NMSU recently provided a week-long workshop for government officials from the BLM, the U.S. Forest Service, the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers, among others.

Surveying engineering students familiarize themselves with handheld Global Positioning System devices that they will use in the field.

A database of public lands survey systems will help officials solve complex planning and management problems using modern geographic information systems, which integrate data with maps. The public will also benefit from having everything in a single database because they will no longer have to visit several offices to find information about land boundaries.

Fishing for lead: using fish bones to clean soils at firing range sites

Processed fish bones have the ability to remove heavy metals from contaminated water and soil.

Judith Wright does not throw away fish bones.

She uses them to remove lead, uranium, TNT and heavy metals during environmental remediation.

Wright, a researcher with Phosphate-Induced Metal Stabilization or PIMS NW Inc., a company working with NMSU, and James Conca, director of the Carlsbad Environmental Monitoring and Research Center (CEMRC), have developed an efficient method of using processed fish bones, called Apatite II, to remove these contaminants from water and soil.

CEMRC is a unit of NMSU's College of Engineering Institute for Energy and the Environment.

Five pounds of fish bones will remove up to a pound of contaminants, estimates Conca. The technology is inexpensive, too. Forty dollars' worth of fish bones will clean more than a million gallons of water contaminated with lead and more than a ton of contaminated soil.

Teeth and bones are made up of the mineral apatite or calcium hydroxy-phosphate. Apatite has the ability to fit different elements into its structure by replacing one of its components with another element, said Conca. Lead, uranium, manganese, plutonium and strontium can replace calcium; carbonate can replace phosphate; and fluorine and chlorine can replace hydroxyl.

Wright discovered the fish bone possibility as a graduate student in geology at Oregon State University, Conca said. She examined the fossils of tiny animals that first used apatite in the Cambrian period, more than 500 million years ago. These animals, called conodonts, were small creatures with tooth-like hard parts the size of a grain of sand that they used to eat their way into their prey.

The conodonts flourished for 300 million years, to the end of the Triassic period, Conca said. By studying their chemistry and those of more recent fish, Wright discovered that the fossils were full of heavy metals that had been taken up by their teeth and bones after death as they lay on the ocean floor. She determined that once incorporated into teeth and bones, these metals were stable for millions of years.

Conca said when Wright began working in the field of environmental remediation, cleaning up areas contaminated by various industrial and government practices over the last century, she realized that fish bones could be an ideal material for removing metals from contaminated water and soil. Also, the bones' ability to buffer the acidity or alkalinity of water makes them ideal for ecological applications.

Working with Conca at NMSU over a period of years, Wright has implemented this technology to clean up lead and copper at Camp Stanley, a military firing range in Boerne, Texas, and lead, cadmium and zinc in acid mine drainage at the Success Mine and Mill site in northern Idaho. Together, they obtained a patent on this technology.

Recently, Geof Smith of NMSU's biology department and one of his students, Marissa Martinez, have been successful in working with Wright to use the fish bones to clean up TNT and perchlorate in contaminated military soils.

Faculty Honors

Civil engineering Head Kenneth White receives national honor

Kenneth R. White, head of the NMSU department of civil engineering, received the Distinguished Service Award with Special Commendation from the National Council of Examiners for Engineering and Surveying (NCEES) at the group's annual meeting in August 2005. The NCEES develops licensing examinations for the engineering and surveying professions.

White was honored for his service to the engineering and surveying professions. He received the NCEES Distinguished Service Award in 1999 and since then he has continued to provide outstanding service to NCEES and to the New Mexico Board of Licensure for Engineers and Surveyors, according to the NCEES.

White has chaired and been a consultant to a number of committees for the New Mexico board. He also served as NCEES Western Zone vice president from 2002 to 2004, as chair of the Committee on Examinations for Professional Engineers from 1999 to 2001, and as liaison or consultant to the Examination Audit Committee, the Committee on Examination Policy and Procedures, the Task Force on Test Administration, and the Computer-Based Testing Oversight Group. He worked on the Civil Exam Committee for several years, serving as chair from 1997 to 1999.

First recipient of Robert W. Davis professorship named

An assistant professor of chemical engineering at NMSU was recognized as the first recipient of the Robert W. Davis professorship during Homecoming 2005.

Shuguang Deng joined NMSU in August 2003. Since then, he has helped create research programs in hydrogen fuel cell and water treatment, obtained a number of research grants and created two new elective courses.

"In his short time here, Professor Deng has shown exemplary performance in both teaching and research," said Steven Castillo, dean of the College of Engineering.

Deng earned bachelor of science and master of science degrees in chemical engineering from Zhejiang University in Hangzhou, China. He earned his doctoral degree in chemical engineering at the University of Cincinnati.

Robert Davis, an NMSU alum and the former president and CEO of Chevron Chemical Co., provided a large part of the funding for the professorship.

Engineering dean appointed to National Science Foundation advisory committee

NMSU College of Engineering Dean Steven P. Castillo was appointed to the National Science Foundation (NSF) Advisory Committee for Cyberinfrastructure (ACCI) in early 2006.

The ACCI advises the NSF Office of Cyberinfrastructure (OCI) on the acquisition and development of state-of-the-art cyberinfrastructure resources, tools and services needed to support the nation's science and engineering research and education. The office also supports the training of researchers and educators to use these tools and resources to further their goals. The advisory committee meets twice yearly to focus on NSF's cyberinfrastructure programs and plans. The 24-member committee is composed of academic and industry leaders in computer engineering education and research.

Castillo received a bachelor's degree in electrical engineering from NMSU and master's and doctoral degrees in electrical engineering from the University of Illinois, Urbana. He joined the NMSU faculty in 1987 and was head of the university's Klipsch School of Electrical and Computer Engineering from 1998 until 2004, when he became dean of engineering. He won the NSF Presidential Young Investigator award in 1991 and was named as an NMSU Regents Professor in 2004.

Michael Giles earns prestigious engineering title

Michael Giles, professor of computer and electrical engineering at NMSU, has been elected a Fellow of the International Society for Optical Engineering (SPIE), an organization dedicated to advancing scientific research and optical engineering applications. He was honored at the annual SPIE meeting in August 2005.

Giles was elected a fellow for his outstanding achievement in optics, the study of light. Since 1982, Giles has expanded optics education at NMSU from two survey classes in the Klipsch School of Electrical and Computer Engineering to a full optics program that has graduated 10 doctoral students, 66 master's students and more than 160 undergraduates.

To be elected as an SPIE Fellow, Giles had to be nominated by an active SPIE Fellow. The nomination was reviewed by a committee. "It's a great honor," Giles said. "This was not something that I sought – they came to me, and I have great respect for the other Fellows."

Papers by NMSU authors are most cited

Two papers written by authors from NMSU on Very Large-Scale Integration (VLSI) circuits have been listed as some of the most cited papers in the Institute of Electrical and Electronics Engineers, Inc. (IEEE) Circuits and Systems Society since 1990.

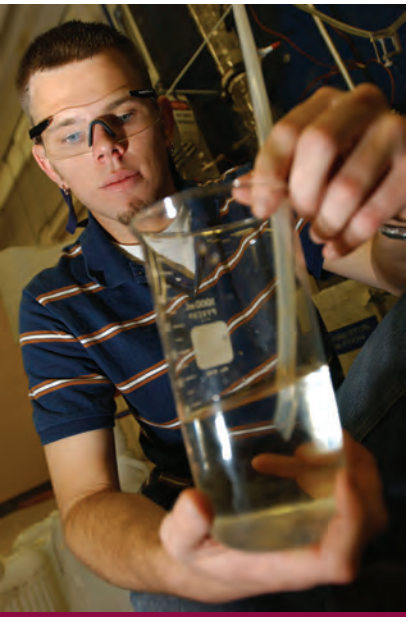
"Current-mode continuous-time filters: two design approaches" was written by Jaime Ramirez-Angulo, Edgar Sanchez-Sinecio, and Moises Robinson. "High frequency compensated current-mode ladder filters using multiple output OTAs" was also written by Ramirez-Angulo and Sanchez-Sinecio.

"It is a great honor for me," Ramirez-Angulo said. "It provides additional motivation for me and very especially for my outstanding students to continue making contributions in this field. My institution has always been extremely supportive of my research efforts. This recognition will make them realize that this support has been instrumental for the continued success of our work."

Ramirez-Angulo is a Klipsch Professor, IEEE fellow, and director of the Mixed-Signal VLSI Laboratory at the Klipsch School of Electrical and Computer Engineering.

Student Accomplishments

NMSU student named Goldwater Scholar



NMSU junior Brian Lusby has been awarded the Barry M. Goldwater Scholarship.

NMSU junior Brian Lusby has been awarded the Barry M. Goldwater Scholarship, a prestigious $7,500 award that recognizes exceptional students for their academic excellence in mathematics, engineering and science.

The scholarship, established by the U.S. Congress in honor of Sen. Barry M. Goldwater, was designed to foster outstanding students to pursue careers in the fields of mathematics, the natural sciences and engineering. Only 323 scholars were chosen for the 2006-2007 academic year out of the more than 1,000 that applied.

"It's nice to know that I can put NMSU's name out there," said Lusby, a chemical engineering major and mathematics minor. "The more people that hear about our university, the more they want to come here. The more people that come here, the more valuable my degree becomes."

"This is an extremely competitive scholarship," said Jason Ackleson, associate dean of the Honors College and director of the Office of National Scholarships. "Brian is a superb student. He met all of the qualities of a Goldwater Scholar."

Lusby said his ability to stay disciplined through his educational career has to do with his dream of becoming an astronaut.

"Ever since I can remember, I've wanted to be an astronaut. I've worked very hard to get myself closer to that goal," he said.

Lusby is a member of the Flying Aggies, a student research team that designs, develops and conducts micro-gravity experiments as part of NASA's Reduced-Gravity Student Flight Opportunities Program. He worked at the Johnson Space Center in a cooperative education position.

NMSU's concrete canoe team, back row left to right: Diego Benavidez, Zach Trujillo, Brian Smith, Edward Montoya, Paul Evans. Front row, left to right: Concepcion Mendoza, Shannon Roe, Mary Chapler, Melissa Cline, Haley Cowen, Ashleigh Wilson, Kristen Fajardo. In front: faculty adviser Kenny Stevens.

Concrete Canoe team places second

The NMSU student chapter of American Society of Civil Engineers rowed "The Who Canoe" to second place overall in the 2006 Rocky Mountain Regional Concrete Canoe competition held in April. Teams were awarded points for academic and racing events, which were added up to determine the overall winner.

Kenny Stevens, associate professor of engineering technology and faculty adviser for the team, estimated that about 4,000 hours were spent on canoe construction this year. The team spends nearly a year in preparation for the competition, Stevens said.

The competition gives students an opportunity to apply what they've learned in the classroom, he said. "They have to take all the stuff that they learn and make something out of it."

The NMSU team decided on a Dr. Seuss theme for their project this year. "The Who Canoe" is adorned with "Seussian" details. The theme extended beyond the canoe, of course: the entire 10-minute oral presentation rhymed.

Student selected for CERN internship

Phillip Davis, a senior in the Klipsch School of Electrical and Computer Engineering, is one of only 15 students selected nationwide for an internship at CERN in Geneva, Switzerland.

CERN, the European Laboratory for Particle Physics, is the birthplace of the World Wide Web and is one of the world's premier laboratories. Davis, along with 14 other students, participated in the company's research experience for undergraduates (REU) program.

"[Davis] showed a great deal of initiative in applying for this opportunity and the fact that he got it, especially given the competition, says good things about both his abilities and the capabilities of our students," Charles Creusere, associate professor at the Klipsch School of Electrical and Computer Engineering, said.

Seventy-nine students have participated in the program, which has been in place since 2001. Last summer, students worked on a variety of projects ranging from X-ray scanning to top mass analysis.

The program, which runs from June to August, allows students to work with active research groups at CERN and be mentored by experts in the field of their choice.

Civil engineering students inspect roads

Twelve students from NMSU hit the pavement in the summer – some 7,714 miles of it to be exact.

The civil engineering students visually examined a portion of every mile of pavement of state roads and highways in southern New Mexico. Their peers from the University of New Mexico (UNM) covered the highways in the north.

Equipped with fluorescent vests and hats and using laptop computers, the students recorded cracks, tears, ruts, and other types of deterioration of the roads. The data they collect will be compiled into the state's annual report on the conditions of New Mexico highways. The New Mexico Department of Transportation (NMDOT) will use this information to determine if routine maintenance or rehabilitation is needed. It also will be used to develop deterioration models that can predict future pavement conditions.

From left: Civil engineering students Judith Gallardo and Abel Garcia, along with civil engineering Professor Paola Bandini demonstrate techniques for measuring road wear on Route 28 in Mesilla Park.

The students stop at every mile marker and examine a tenth of a mile of pavement. The students look for seven types of distresses in the pavement. They evaluate the severity and extent of the conditions on a scale of one to three. Experienced NMDOT staff trained them for this job.

"The DOT is putting a lot of trust in our judgment," said Abel Garcia, a senior civil engineering student who is specializing in structures. "My partner and I both have a background in construction and project management, so I feel like we are qualified for the work."

"This is an excellent opportunity for engineering students to gain perspectives in their field while also being employed on such a critical research project for our department," state Transportation Secretary Rhonda Faught said.

Overseeing the students is Paola Bandini, assistant professor of civil engineering.

"This is important data for the state that will be used in pavement management," Bandini said. "It has to be on schedule and it has to be accurate. We've selected some of our very best students to participate in this project."

Student-built test facility could lead to safer nuclear facilities

A team of NMSU engineering technology students has designed and built a prototype test facility that could be a step toward more reliable air filtration systems for certain types of nuclear facilities.

The prototype is designed to test high-strength HEPA (high-efficiency particulate air) filters for use in nuclear facility ventilation systems. High-strength filters are used in German nuclear facilities but are not part of the U.S. national Code on Nuclear Air and Gas Treatment, faculty member Craig Ricketts said. Ricketts is a member of the committee that helps write the code section for the American Society of Mechanical Engineers (ASME).

"In the event of an accident, these filters are all that stands between the radioactive materials inside and the surroundings outside," he said.

In high-strength HEPA filters, the filter medium is reinforced with a fiberglass cloth so the filters could withstand greater pressure changes in the case of an explosion or a loss-of-coolant accident subjecting the system to steam pressure.

The fiberglass reinforcement doubles the cost of a filter, but the main hurdles are regulatory ones, Ricketts said. For filters to be certified as nuclear-grade, the performance standards must be written into the code, requiring test facilities to qualify the filters.

Thanks to the students' work, there now is a prototype for such a facility – "the only one of its kind in the world," Ricketts said.

Ricketts' class designed a test facility that pumps water through a filter during a test instead of blowing airborne water spray through it.

"You get the equivalent pressure but the investment cost is lower, the operating costs are lower and the energy demands are lower," he said. "You need something that is relatively compact and inexpensive, but it's important to test the filters under wet conditions."

The students' prototype test facility has two components, one that subjects the filter to pressurized water and one that tests the filtration efficiency of the filter in air flow before and immediately after the water test.

Kristopher Ingram Named Sullivan Fellow

General Motors, along with the United Negro College Fund, selected NMSU mechanical engineering student Kristopher Ingram as a recipient of the GM Sullivan Fellowship Program designed to foster social responsibility in the workplace.

The GM Sullivan Fellowship Program is named for the late Rev. Leon Sullivan, who was the first African American man to serve on the GM board of directors. In 1977, Sullivan developed the Sullivan Principles as a code of conduct for companies operating in South Africa. In 1997, these principles were expanded as a means to improve human rights, social justice and economic fairness in countries throughout the world. Today, the Global Sullivan Principles of Social Responsibility are embraced by hundreds of companies around the world.

This award includes a $5,000 grant to NMSU that will be used to develop the Sullivan Principles program on campus.

An additional $5,000 scholarship will be awarded to Ingram upon the successful completion of a GM summer internship and the completion of a written and oral presentation on the Sullivan Principles. General Motors selects students from both the Engineering and Business colleges to participate in a competition for the award.

NMSU engineering technology students Jeff Nelson of Albuquerque, left, and Roberto Briones of Las Cruces, right, tighten a bolt on a filter test facility designed and built as a senior class project. Faculty member Craig Ricketts looks on.

College Support

Technology group makes largest-ever in-kind contribution to NMSU

The largest in-kind corporate contribution ever received by NMSU – computer software systems, equipment and training with an in-kind commercial value of $112.7 million – was announced in March 2006 by Partners for the Advancement of Collaborative Engineering Education (PACE).

PACE is a joint philanthropic initiative of General Motors, EDS, Sun Microsystems and UGS Corp. that has worked together since 1999 to support key academic institutions worldwide with computer-based engineering tools to prepare mechanical designers, engineers, and analysts with the skills to compete in the future.

The PACE in-kind contribution will enhance NMSU's engineering programs and help prepare students for careers in vehicle design, engineering and manufacturing, as well as other fields.

"Our students will be using the same computer-aided design and engineering systems used by General Motors and other leading industries, and our graduates will be prepared to hit the ground running," said NMSU Dean of Engineering Steven Castillo. "This will be a tremendous advantage to our students and to the companies that need a highly skilled and trained work force."

The PACE software will be used primarily by engineering students and faculty. These powerful modeling and simulation tools will allow students to design projects ranging from more efficient factories to simulated automobile crash tests to the flow of blood through artificial heart valves.

With the addition of NMSU, the PACE collaboration now includes 35 strategically selected universities around the world, including MIT, Virginia Tech, the University of Michigan and Georgia Tech. For General Motors, the initiative is an investment in the company's future.

Robert Kruse, left, executive director of vehicle integration and performance for General Motors, with Jan Martin, wife of NMSU President Michael Martin, and NMSU Engineering Dean Steven Castillo following the announcement of the largest in-kind corporate contribution ever received by NMSU.

"The definition of what an engineer does is changing," said Robert Kruse, GM's executive director for vehicle integration and performance. "Being proficient with the latest computer-based design tools opens up new career opportunities throughout the engineering world. That's why the PACE program and institutions like New Mexico State are so important. Our common goal is to help train engineers to succeed in the rapidly evolving engineering environment of the future."

College receives $1.5 million gift

In support of the NMSU "Doing What Counts" comprehensive campaign, brothers Ed and Harold "Chub" Foreman have made a $1.5 million gift to the NMSU College of Engineering, their alma mater.

The donation from the Foremans, who both earned bachelor of science degrees in civil engineering at NMSU, establishes two professorships and one endowed chair in civil engineering. The gift will also be used to bolster recruitment and retention of students in the College of Engineering.

"This is the largest gift ever received by the College of Engineering and will help us recruit and retain excellent faculty, specifically in the field of civil engineering," said Steven P. Castillo, dean of the College of Engineering. "It also serves as an outstanding endorsement of the engineering education provided here at NMSU."

The Foreman brothers were born and raised on a peanut and sweet potato farm in Portales, N.M. In 1988, both were selected as part of the top 100 alumni from the NMSU College of Engineering.

"Although in the early days we didn't have a lot of material things, we were indeed rich. Over the last few years, we've been able to accumulate a little money and we are pleased to contribute, in whatever way possible, to help people grow," Chub said.

Harold Foreman's career began in heavy construction and led to real estate brokerage and management. He is president and co-owner of Valley Leasing and Development Inc., a property management and asset holding company in Las Cruces. In 1984 he was elected to the New Mexico Senate, where he served for eight years.

While working as an oil field hand, Ed Foreman launched a highly successful petroleum-related business that made him a millionaire by age 26. He is the only person in the past 100 years to be elected to the U.S. Congress from two states – New Mexico and Texas. Today, Ed is one of the country's top motivational speakers.

Ed Foreman and his brother Harold "Chub" Foreman made the largest private gift ever received by the College of Engineering.

Intel Corp. is a major supporter of the Las Cruces Pre-freshman Engineering Program (PREP), a seven-week, academically intense, summer program with the goal of preparing high-achieving pre-college students for careers in science, engineering and mathematics. Pictured here is the 2006 PREP class.

NMSU to benefit from six-figure Intel donation

A $470,529 check presented by Intel officials to NMSU will help the university's College of Engineering, College of Education and Doña Ana campus.

"Intel New Mexico is working with our state's community colleges and universities to encourage students to enter technical careers," said James Reed, New Mexico/Texas education manager for Intel. "We stress that the money should be used for math education, which opens the door to science and engineering technology careers. Students at the community college level are continuing to enter technical careers. Our scholarship donations will lead to education for these students which will lead to employment in technology."

Jacob Dominguez, Intel's college strategic programs manager, is an alumnus of NMSU. He said his company needs to invest to help NMSU develop.

The College of Engineering received $404,529 from the check. Of that amount, $185,500 will be used for outreach programs, $116,529 for equipment and $99,500 for scholarships.

NMSU-Doña Ana received $50,000 from the check and the College of Education received $16,000.

Chapman Endowed Professorship established

A $400,000 endowed professorship was established in NMSU's department of mechanical engineering in September 2005. It was the first fully endowed professorship in the department.

The Dwight L. and Aubrey Chapman Endowed Professorship was established through an estate gift from the Chapmans. Dwight Chapman received a bachelor of science degree in mechanical engineering from NMSU in 1933. He started his collegiate career at Southern Methodist University, but transferred to NMSU because of the co-op program it offered to its students.

"The Chapman Endowed Professorship will allow us to recruit a nationally renowned faculty member into the mechanical and aerospace engineering programs," said Steven Castillo, dean of the College of Engineering. "This supports the College of Engineering's drive toward national prominence."

The professorship was established to support key technical areas in mechanical engineering such as thermal/fluid science, mechanics, dynamics and control or design. The holder of the professorship will teach and be involved in research activities promoting educational and professional development of undergraduate and graduate students in mechanical engineering at NMSU.

NMSU has been ranked as one of America's 100 Best College Buys® for ten consecutive years.

College of Engineering Leadership

Steven P. Castillo, Dean
Krist Petersen, Associate Dean of Academics
Rudi Schoenmackers, Associate Dean of Research
Patricia A. Sullivan, Assistant Dean of Development and External Relations
Martha Mitchell, Chemical Engineering Department Head
Ken White, Civil Engineering Department Head
Stephen Horan, Electrical and Computer Engineering Department Head
Sonya Cooper, Engineering Technology and Surveying Department Head
Edward Pines, Industrial Engineering Department Head
Thomas Burton, Mechanical Engineering Department Head
Abbas Ghassemi, Director, Institute for Energy and the Environment

College of Engineering Advisory Council

Floyde Adams (retired)
Adelmo E. Archuleta, Molzen-Corbin and Associates
Dan E. Arvizu, National Renewable Energy Laboratory, U.S. Department of Energy
Thomas M. Beall, V-F Petroleum Inc.
Vincent Boudreau, Nichols Research Corporation
John Burkstaller, Daniel B. Stephens & Associates, Inc.
Dana C. Christensen, Nuclear Technology Applications, Los Alamos National Laboratory
Christopher Scott Croshaw, Wilson & Company, Inc., Engineers & Architects
Robert W. Davis, (retired) Chevron Chemical Co.
David L. Durgin, Verge Fund/Valley Ventures
John Galassini, Phelps Dodge Mining Co.
Timothy Gantick, Honeywell
Enrique Gomez, IBM Global Services
Sylvia Grace, Gilbert Unified School District
Karen W. Hench, Los Alamos National Laboratory
Christopher W. Hickman, Cellnet
Walter Hines, CH2M Hill
Arthur D. Hurtado, Invertix Corporation
Jay B. Jordan, NMSU Physical Science Laboratory
General Lester L. Lyles, The Lyles Group
Margaret S. Morse, The Boeing Company
Robert G. Myers, (retired) Northrop Grumman
Orlando T. Padilla, General Motors Corporation
Daniel M. Sachs, Team Technologies, Inc./Team Specialty Products Corporation
Jerome Shaw, VOLT Information Sciences Inc.
Juan Silva, Raytheon Missile Systems Electronics Center
Samuel R. Skaggs, (retired) Los Alamos National Laboratory
Jerry W. Strange, (retired) El Paso Natural Gas Company
Robert D.M. Tachau, Sandia National Laboratories
Jeffrey L. Weiner, IBM Corporation

New Mexico State University
College of Engineering
MSC 3449
P.O. Box 30001
Las Cruces, NM 88003-8001

505.646.2911
www.engr.nmsu.edu