ME Connections

A publication of The University of New Mexico's Department of Mechanical Engineering

Fall 2021

FROM THE CHAIR

In the spring 2020 semester when the transition to remote operations came, one never imagined that the whole world would still be managing through the pandemic after so many months. By now, we are also amazed that we have actually been able to conduct so many aspects of our mission successfully even in these extraordinary times. The pandemic has shown us the benefits of broadening our approach to education. Our faculty and student researchers continue to push forward the frontiers of research, to help address societal challenges in sustainability, security, and human wellbeing. In this issue of *ME Connections*, we highlight some of our recent accomplishments and present a sampling of our educational initiatives, cutting-edge research, and community engagement.

Special thanks go to Christos Christodoulou, dean of the School of Engineering, for his strong support of the ME department, and to Kim Delker, School of Engineering marketing manager, for her invaluable help in preparing this publication.

Yu-Lin Shen
on behalf of the entire ME family

New theoretical strategy means more control, less energy

Researchers from The University of New Mexico have discovered a connection that has implications in the area of optimal control theory.

The results are detailed in "Controlling Network Ensembles," authored by Isaac Klickstein and Francesco Sorrentino (left), both of the Department of Mechanical Engineering, which was published in *Nature Communications*.

Sorrentino explains that it is the ultimate goal to control a system in the form of a network, but in many applications, the exact network structure may not be obvious or may evolve in time in ways that are unpredictable. There are a variety of configurations within any process, but it is not often known which one is prevalent at any given time.

"Thinking of it as a large social network one is trying to influence, we may not exactly know who is friends with who. In control theory, we want to control the system, but we are not always sure of the existence of connections, and those matter. Depending on whether the connections exist or not, the control strategy will vary," he said.

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MORE CONTROL, LESS ENERGY

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In control theory, it is not always known which things are connected, but UNM researchers have developed a control strategy that works for any of the combinations.

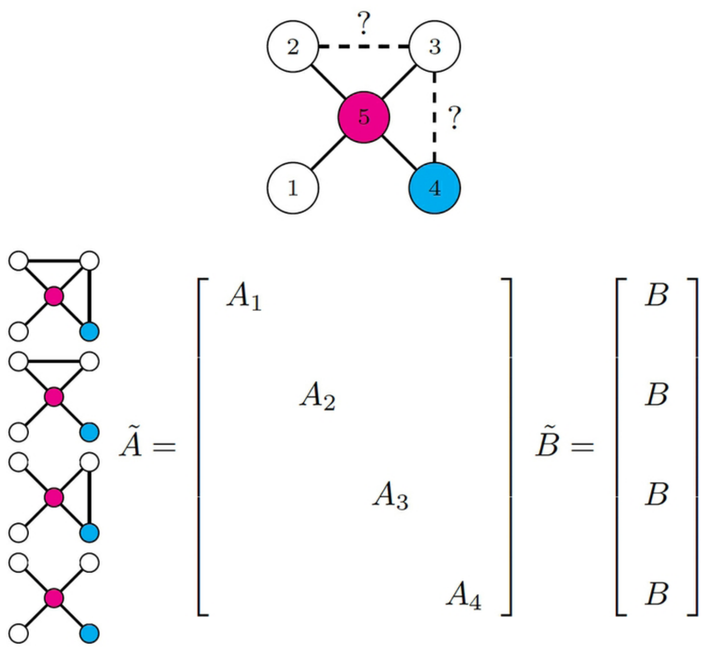
He and Klickstein were able to develop a mathematical theoretical solution that may circumvent this issue.

"We derived a control strategy that works independently of which configurations we're in," Sorrentino said. "From this, we can come up with a control strategy that works for any of the combinations."

The downside of this process, however, involves a cost. Conventional wisdom says that more energy is expended as the number of configurations increases. But the UNM-derived strategy had a surprising benefit.

"The fascinating thing is the control energy tends to expand for a large number of configurations, but our strategy found that it eventually is going to plateau. It grows, grows, grows, then it saturates," Sorrentino said. "And that saturation is important because it means that we can possibly control, with a finite amount of energy, any number of network configurations."

Sorrentino's research focuses heavily on theoretical mathematical models, especially in the areas of control theory and synchronization. He calls this latest research "unapologetically theoretical," but significant nonetheless.



"This gives us hope we can control uncertain systems while keeping the energy expenditures in check," Sorrentino said.

This research is supported by National Science Foundation grants.

Sorrentino's work looking at how various systems are linked and how each action affects another action has explored such areas as how to reduce energy consumption when trying to control a large distributed system, such as the power grid, the food web or the Internet.

"This work has many potential applications," Sorrentino said, including the control of autophagy, a key physiological process known to be involved in cellular aging, neurodegeneration and immune defense.

Last year, Sorrentino was awarded the National Institutes of Health Trailblazer Award from the National Institute of Biomedical Imaging and Bioengineering for a project that could improve the way drugs for diseases are timed and delivered to patients.

UNM study: Sneeze guards could make airplanes safer from COVID-19 spread

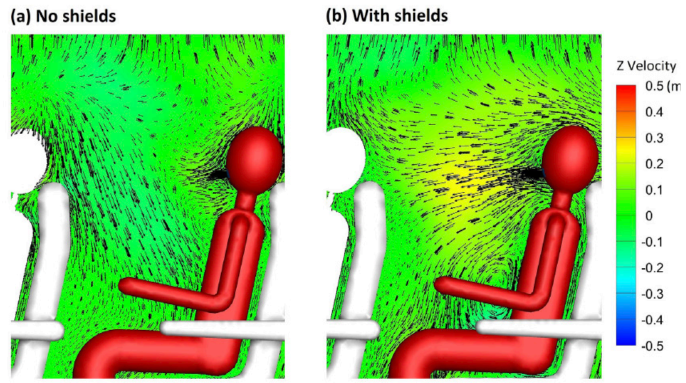
The ongoing COVID-19 pandemic has significantly reduced the number of people willing to fly due to safety concerns, and to ease fears, some airlines have opted to leave middle seats open to increase the amount of space for social distancing.

But the findings of a study led by researchers from The University of New Mexico and Imperial College London suggest that nonporous plastic shields (often called “sneeze guards”) installed between seats can prevent significant amounts of COVID-19 particles from being transmitted between passengers, thus allowing for fuller airplanes, and in turn, more revenue for airlines.

The study, “Simulation of aerosol transmission on a Boeing 737 airplane with intervention measures for COVID-19 mitigation,” was published March 16, 2021, in *Physics of Fluids*. Authors of the paper are Khaled Talaat of the UNM Department of Nuclear Engineering, Mohamed Abuhegazy of the UNM Department of Mechanical Engineering, Omar A. Mahfoze of the Department of Aeronautics at the Imperial College London, Osman Anderoglu, assistant professor of nuclear engineering at UNM, and Svetlana V. Poroseva, associate professor of mechanical engineering at UNM.

The study looked specifically at the Boeing 737 cabin and its ventilation system and cannot automatically be generalized to other airplanes with different ventilation systems or other public spaces without further study, Abuhegazy said.

The study compared aerosol transmission in three situations: an airplane at full capacity, an airplane at reduced capacity (no middle seats) and an airplane at full capacity with sneeze guards between passengers. The team was able to conduct a series of simulations to model aerosol transport in a



section of the cabin using particle sizes similar to those emitted during speech, breathing, and coughing.

The researchers compared the velocity distribution of air through a section of the cabin, finding that there were substantial differences in the flow pattern after sneeze guards were installed. The shields essentially kept the airflow and the particles on the passenger who emitted them. Based on the amount of aerosol transmission and inhalable particles present in the cabin, “The findings indicate that sneeze guards between passengers are about equally as effective as leaving middle seats vacant,” Abuhegazy said.

He said that in terms of economics, using sneeze guards in full-capacity flights may be more cost-effective than reducing passenger capacity through vacating middle seats, considering that the shields are reusable (sanitizing the shields after each flight was recommended, as was covering seats and disinfecting walls between flights). Another finding recommended that passengers be boarded in smaller groups, starting in the back, and waiting two to three minutes between groups, as the study found that aerosol particles were settled in that timeframe.

New model simulates wildfires from single branches to local weather systems

Every year, the headlines about wildfires seem to be getting worse. For instance, this year, the Bootleg fire in Oregon became so large that it created its own weather.

Among the researchers at The University of New Mexico who are studying wildfires from various perspectives is Daniel Banuti, an assistant professor of mechanical engineering. He is among a group who presented “Fire in Paradise: Mesoscale Simulation of Wildfires” August 9-13 at SIGGRAPH 2021.

“Our model is unique in that we can simulate a wildfire from the smallest branches up to the formation of clouds above the burning forest, on realistic terrain, and have it run interactively,” Banuti said.

Beyond predicting the path and size of a wildfire, such a model could be used for planning and training, allowing firefighters to engage with the simulation like with a video game.

The model also captures different ecosystems, different levels of forest cover, wildfire management practices, various windspeed, and the growth of pyrocumulus clouds or “fire clouds,” he said.
“It is amazing to see what a multidisciplinary team across three continents can achieve, and I hope this model will help us to understand and control wildfires better,” Banuti said.

Other authors of study are Torsten Hädrich and Dominik L. Michels, both of King Abdullah University of Science and Technology (KAUST); Wojtek Palubicki of Adam Mickiewicz University in Poznań; and Sören Pirk of Google AI.

Watch on YouTube at https://youtu.be/YE6I3IaRzsM

ME researchers create true two-dimensional materials

Sakineh Chabi, assistant professor in mechanical engineering, and her research team created the world's first monolayer silicon carbide, or so-called two-dimensional SiC. The thickness of this newly-discovered material is only 2.5 angstrom, which is the ultimate minimum thickness.

Theoretical studies have predicted that 2D SiC has a stable graphene-like honeycomb structure and is a direct band gap semiconducting material. Experimentally, however, the growth of 2D SiC has challenged scientists for decades because bulk silicon carbide is a strong covalently bonded material. Additionally, bulk SiC exists in more than 250 polytypes, further complicating the synthesis process.

Chabi led her team to demonstrate, for the first time, the successful isolation of 2D SiC from hexagonal SiC via a top-down approach, as reported in their recent paper titled "The creation of true two-dimensional silicon carbide," published in the journal *Nanomaterials* in 2021. Unlike many other 2D materials such as silicene that suffer from environmental instability, the created 2D SiC nanosheets are environmentally stable, and show no sign of degradation.

As a wide bandgap semiconducting material with high thermal capability and high voltage breakdown, SiC is an important material for high-power electronics, high-temperature applications, and quantum information processing. For example, SiC is considered the ideal solution for fast charging of electric vehicle. However, the created 2D SiC material will outperform bulk SiC in a number of ways. As a result of reduced dimensionality, 2D SiC possesses an unusual set of electronic, optical and structural properties, such as direct wide band gap feature, that are very important for the next generation of semiconductors. The use of 2D SiC will contribute to the manufacturing of lighter, faster, more efficient SiC-based devices.

It is anticipated that this work will make a disruptive impact across various technological fields, ranging from optoelectronics and spintronics to electronics and energy applications.

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Sakineh Chabi is also part of the team that recently received an ARPA-E (Advanced Research Projects Agency – Energy, U.S. Department of Energy) award. The project, titled "High Power Density Cost-Effective MVDC Aircraft Cable," is led by Virginia Tech. In this project, Chabi will lead the UNM efforts to develop ultra-lightweight three-dimensional graphene composites for electromagnetic shielding. **Read more on Page 10.**

Banuti part of $6.2 million Department of Energy initiative to promote clean hydrogen technology

A researcher from mechanical engineering is part of a team that is collectively receiving $6.2 million in Department of Energy funding for research and development projects aimed at advancing hydrogen as a high-performing, efficient gas for turbine-based electricity generation.

Eight universities are receiving awards for projects supported by the Department of Energy's Office of Fossil Energy's University Turbines Systems Research program, which will study fundamental scientific challenges and applied engineering issues associated with advancing the performance and efficiency of combustion turbines fueled with pure hydrogen, hydrogen and natural gas mixtures, and other carbon-free, hydrogen-containing fuels.

The universities leading the grant are Georgia Tech, San Diego State University, Purdue University, Ohio State University, the University of California, Irvine, the University of Central Florida and the University of Alabama.

Daniel Banuti, an assistant professor of mechanical engineering, is leading UNM's efforts as part of the University of Central Florida team. That team received $800,000 for "Fundamental Experimental and Numerical Combustion Study of H_2 Containing Fuels for Gas Turbines."

Banuti will be studying how the unique properties of hydrogen (compared to more conventional fuels, such as methane and larger hydrocarbons) affect the combustion process, and to what extent we need to revise common assumptions we use in the simulation of combustion processes.

"These differences mainly stem from the very small size of the hydrogen molecule, which impacts thermodynamic properties and diffusion," he said. Increasing the reliability, efficiency, and performance of hydrogen power is part of an effort by the Biden administration to reduce carbon emissions and achieve 100% clean electricity by 2035.

Khraishi chosen to serve as journal editor for ASME

Tariq Khraishi, professor of mechanical engineering, has been appointed by the American Society of

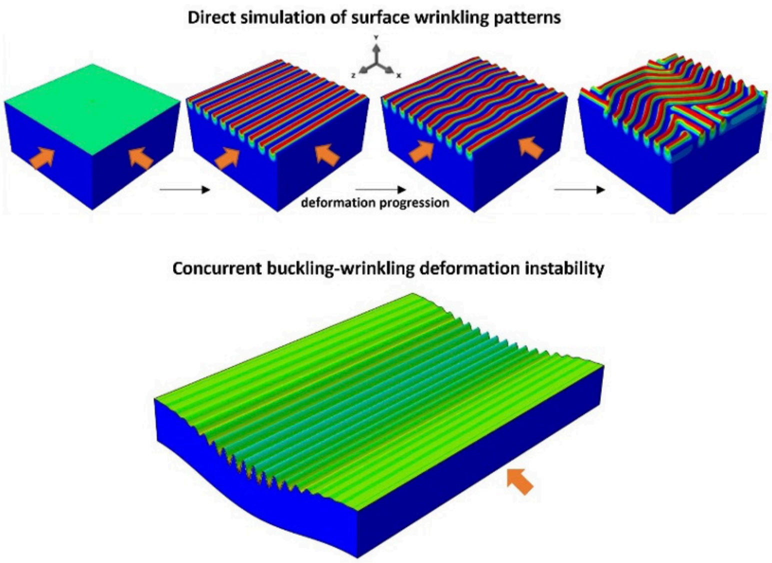
Mechanical Engineers (ASME) to serve as an associate editor of the *Journal of Engineering Materials and Technology*, produced by the society. His appointment is for a three-year term. He also serves on the editorial board of *Modeling and Numerical Simulation of Material Science.*

Other faculty members in the department also currently serve as editors or members of the editorial board for various international research journals. They include:

Daniel Banuti – *Journal of Supercritical Fluids*
Sakineh Chabi – *Materials* (Carbon Materials section)
Ali Heydari - *IEEE Transactions on Neural Networks and Learning Systems*
Nathan Jackson – *Micromachines*
Yu-Lin Shen – *Materials Science and Engineering A* and *Frontiers in Materials*
Francesco Sorrentino – *Chaos*
Peter Vorobieff – *Transactions of the Wessex Institute*

Researchers develop a new way to solve deformation instability problems

Mechanical engineering Ph.D. student Siavash Nikravesh and professor and department chair Yu-Lin Shen have developed a new three-dimensional modeling approach to solving deformation problems, making it easier to design a wide variety of products including flexible electronics.



The factors that determine exactly how a material will buckle when subjected to force are numerous and complex. These types of calculations, called deformation instability problems, typically require multiple steps of analysis to solve, consuming a great amount of time and resources.

Nikravesh explains, "There are some computational approaches that people are using for simulating this sort of deformation instability. These approaches are multistep approaches, which means that they have to use many steps of simulations separately in order to solve the problem; it's not a seamless approach and it may lack true predictive capabilities … We can do it in only one analysis instead of two or three analyses that you have to combine together… it saves a lot of time and it's much easier and a lot of problems that couldn't be solved before—now people can solve them."

In addition to being more efficient than traditional processes, the research group's new method of calculation solves a variety of problems that mechanical engineers encounter when performing deformation instability calculations. Their methodology addresses challenges like the direct simulation of surface wrinkling patterns and concurrent buckling-wrinkling deformation instability of film-substrate structures.

One of the most exciting potential applications of this discovery is the design of electronic devices. Flexible electronic circuit boards are a lighter, smaller, and deformable alternative to traditional rigid circuit boards used in devices like cars, computers and cell phones. According to a recent market research report published by *Industry Research*, a number of major international electronics companies are involved in the development and sale of flexible electronics, including 3M, Samsung, and GE. According to Nikravesh, "The flexible electronics industry will benefit from this very much. These soft devices are all experiencing large deformation and engineers have to be able to predict the deformation and surface instabilities."

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One of the papers these researchers published in *Scientific Reports*, "Instabilities of Thin Films on a Compliant Substrate: Direct Numerical Simulations from Surface Wrinkling to Global Buckling," has been named as a top 100 downloaded materials science paper for *Scientific Reports* in 2020.

School of Engineering receives NSF grant for student success, retention

A research team in the School of Engineering at UNM has been awarded funding from the National Science Foundation (NSF) for a project to uncover new ways to promote academic success and retention among engineering and computer science students.

"Scholarships, Service Learning, and Community Engagement to Improve Student Success in Engineering and Computer Science" is a five-year project that began January 1, 2021, and totals nearly $1 million.

The ultimate goals, said principal investigator Tariq Khraishi, are to help engineering students succeed academically and also to provide data on approaches that work best in the retention of students, ensuring their academic success, and ultimately getting them to graduation.

"Retaining engineering students is a universal challenge, but this is especially true among engineering and computer science students at UNM," said Khraishi, who is a professor of mechanical engineering. "When you consider factors such as family income, educational attainment of parents and other factors, many students at UNM face additional barriers in completing an engineering degree. With this project, we'd like to identify services, programs and activities that can be proven to help our students succeed."

The project addresses the goals of the NSF Scholarships in STEM (S-STEM) Program, which include improving the education of academically-talented, low-income STEM students by supporting them to achieve academic success (including retention and graduation). In addition to helping students, the project will collect data on the cohorts of students and generate new knowledge about best practices — what works and what doesn't work — in retaining these students.

Khraishi said the project will fund scholarships for 120 full-time bachelor students in engineering or computer science (up to $5,000 a year for 24 students annually) over the course of the five-year project, with a special emphasis on academically talented, low-income STEM students. The project will be coordinated through the School of Engineering's Engineering Student Success Center.

All S-STEM scholars in the program will go through career development activities and will be mentored in a learning community environment with faculty mentors. Students in the program will also be tasked with service learning/community engagement activities, either through paid internships or honors/problem courses, for which they will receive academic credit. Students in the program will work with non-engineers in local nonprofits organizations and tribal communities, who will serve as mentors, to collaboratively develop a technical project that will benefit the community.

Co-principal investigators are Heather Canavan, professor of chemical and biological engineering; Trilce Estrada, associate professor of computer science; Maryam Hojati, assistant professor in the Department of Civil, Construction and Environmental Engineering; and Christos Christodoulou, Jim and Ellen King Dean of Engineering and Computing and Distinguished Professor in the Department of Electrical and Computer Engineering.

ME Connections

STUDENT AWARDS

Mechanical engineering Ph.D. candidate **BRIAN ROMERO** has been named the Charles Griffith Graduate Fellow in Science and Technology. Reserved exclusively for UNM doctoral students in STEM programs, the Griffith Fellowship is extended to a highly-qualified graduate student who is nominated by a department and subsequently selected by a subcommittee of UNM's Faculty Senate. Romero was also awarded the New Mexico Space Grant Consortium Graduate Research Fellowship.

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Mechanical engineering graduate student **DANIEL FREELONG** is the recipient of the Regents' Minority Doctoral Fellowship beginning in Fall 2021 for two years. This prestigious award, one of only two offered each year, recognizes the student's academic merit and promise to excel in the graduate program at UNM.

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JUAMPABLO HERAS RIVERA and **HYEIN CHOI** were awarded New Mexico Space Grant Consortium Undergraduate Research Scholarship.

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The following students won the 2021 School of Engineering Annual Awards:

DAISY BELMARES-ORTEGA received the Mechanical Engineering 2021 Outstanding Sophomore Award.

BELMARES-ORTEGA

RIVERA

TEODORO

ABUHEGAZY

REYNALDO TEODORO received the Mechanical Engineering 2021 Outstanding Junior Award.

JUAMPABLO HERAS RIVERA received the Mechanical Engineering 2021 Outstanding Senior Award.

MOHAMED ABUHEGAZY received the Mechanical Engineering 2021 Outstanding Graduate Student Award.

STAFF AWARDS

Congratulations also to the two mechanical engineering advisement staff for their recent awards:

ANNA MAE APODACA, senior academic advisor, received the School of Engineering Outstanding Staff Award.

JJ CONN, senior academic advisor, won the UNM Provost's Committee for Staff "Kindness Award."

APODACA

CONN

Chabi leads Department of Energy project to advance all-electric aviation

Two researchers from the UNM School of Engineering are on a team that has received funding from the U.S. Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E) to create new composites to shield cables in electric aircraft in an effort to make fully-electric aviation technology more commercially feasible.

The $1.17 million project, which began in August 2021, is called "High Power Density Cost-Effective MV DC Aircraft Cable." The project is being led by Mona Ghassemi of Virginia Tech, and UNM is part of that team.

Sakineh Chabi, assistant professor of mechanical engineering, and Jane Lehr, professor of electrical and computer engineering, are leading the project at UNM. Their task will be to make ultra-lightweight, three-dimensional graphene composites for electromagnetic shielding of cables on electric aircraft.

The award from ARPA-E's Topics Informing New Program Area's Connecting Aviation By Lighter Electric Systems (CABLES) Topic is for the development of technologies for medium-voltage power distribution cables, connectors and circuit breakers for fully-electric aviation applications.

Air travel remains a growing contributor to U.S. greenhouse gas emissions, with recent estimates placing commercial air travel at nearly 3% of total domestic greenhouse gas emissions. In response to this, in 2020, ARPA-E launched focused programs that may enable the mitigation of greenhouse gas emissions in the space through the adoption of electric aviation technologies. CABLES teams will further complement these programs and their goal of developing electric aviation solutions by addressing another challenge existing within all-electric aircraft — power distribution.

The ultimate goal of the Virginia Tech-UNM project is to make the power density of electric aircraft closer to conventional aircraft. In order for that to happen, an electric power system with high-power delivery and low-system mass is necessary. As an essential component of aircraft electric power systems, cables are necessary to transmit power from one node to another.

The team will develop a high-power density, cost-effective cable for twin-aisle, all-electric aircraft. Innovations include conductors with increased current-carrying capacity; a multilayer, multifunctional insulation system made of exceptionally high-thermal conductivity materials; and a new insulation solution for higher voltages with superior mechanical strength and electrical reliability. Designed for DC voltage, the new insulator will allow fewer partial discharge events and provide improved electromagnetic interference protection.

ME students on winning team in Global Scaling Challenge

A group of School of Engineering students participated in the inaugural Global Scaling Challenge, hosted by The University of New Mexico Anderson School of Management. The engineering students tied for fourth place among 17 student teams from around the world.

The event took place virtually April 22-24, 2021, with the goal being to help three New Mexico-based companies identify ways to scale globally and complete a live 10-minute presentation in front of a panel of judges comprised by CEOs and managers of multiple companies throughout New Mexico.

The three firms involved this year were BennuBio, a medical instrumentation company focused on flow cytometry; Build with Robots, a robots-as-a-service company focused on addressing COVID-19 needs; and Wildlife Protection Management, a firm addressing the wild horse problem on four continents.

The three participating firms received innovative advice from the diverse pool of students, faculty and mentors.

The School of Engineering team, mentored by Peter Vorobieff, professor of mechanical engineering, tied for first place the first day when presenting their strategy to help scale Build with Robots. The team won a $2,500 prize for tied fourth place overall in the competition.

The team was comprised of:

JESUS ORTEGA, Ph.D. candidate in mechanical engineering and an alumnus of the Anderson School of Management

IRMA ROCIO VAZQUEZ, Ph.D. student in mechanical engineering

NIKHILESWARA REDDY NAGURU, a master's student in electrical engineering and alumnus of the Anderson School of Management

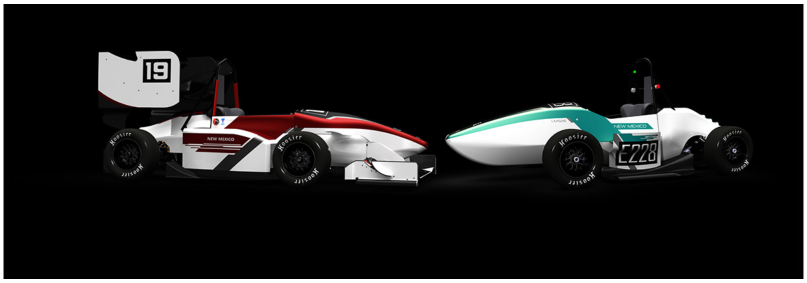
BHUVANESHWARR RAMALINGAM, a master's student in electrical engineering.

Judges included well-known global faculty, industry experts, firm leaders, venture capitalists and thought leaders.

Teams were provided information before the competition, including the firms' value propositions and materials from the firms, as well as an artificial intelligence-based workup of potential customers, investors and acquirers; and written material prepared by Boston Analytics. Teams gave 10-minute presentations live to a judging panel and the subject firm, followed by 10-minute Q & A periods.

For more information or to register for the 2022 challenge, visit Global Scaling Challenge website at https://www.innovationunm.com

LOBOmotorsports scores well in virtual contests, ready for more success in new lab



Despite the disruption of 2020-21, with the pandemic cancelling or pushing formerly in-person contests in the virtual realm, UNM's Formula Society of Automotive Engineers (FSAE) teams still managed to score well in competitions this year.

The LOBOmotorsports team placed in the top five in the world in two virtual competitions that focused on team organization and operations. The FSAE Knowledge Event featured 132 teams in the internal combustion competition and 51 teams in the electric vehicle contest and included teams from top engineering schools around the globe.

In February 2021, UNM competed in the electric vehicle (EV) category, placing No. 1. In a separate event, the internal combustion engine team placed fourth.

"UNM was only one of 22 teams that entered both competitions and the only school in the competition to finish in the top 10 in both categories," said John Russell, professor of mechanical engineering and director of the FSAE LOBOmotorsports program. "This is a fantastic accomplishment for LOBOmotorsports."

Unlike a driving contest that relies upon speed and performance, these contests focused on presentation, with both teams emphasizing the unique integration of the FSAE program into the engineering curriculum as an alternative senior design program.

And in May, the LOBOmotorsports team took top 10 honors — including a first-place finish — in the finals of the virtual FSAE Knowledge Event.

UNM's electric vehicle (EV) car finished No. 1 in the presentation category, No. 7 in design and No. 7 overall. UNM placed higher than the top 10 engineering schools in the country, with exception of Stanford University, which did not compete.

Meanwhile, the internal combustion (IC) car finished No. 4 in presentation and 20th in design. They placed 36th overall in the the world, placing higher than Arizona State, Duke University, Brown University and Rensselaer Polytechnic Institute.

For the No. 1 slot, UNM beat out top-ranked programs such as University of California – Riverside and the University of Pennsylvania.

In addition, UNM's EV car was awarded the 3-View Drawing Excellence Award, one of only three EV teams to receive the honor.

Russell said this year was challenging due to the virtual format and competing in the EV contest for the first time, but it makes the success all the more worthy of celebration.

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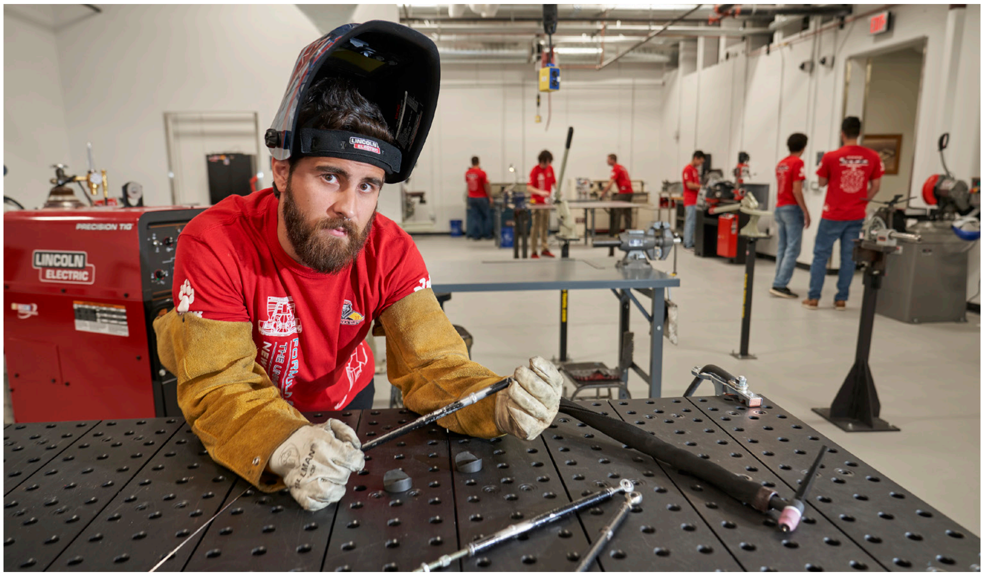

MEMBERS OF THE FSAE TEAM NOW HAVE A SPACIOUS, WELL-LIT AREA TO PRODUCE AWARD-WINNING CARS IN THE BASEMENT OF FARRIS ENGINEERING CENTER.

FSAE

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"I am especially proud of our efforts on the EV car since it is our first," he said. "There was a lot to learn. Electric cars are quite complex, and the safety aspects of dealing with high voltage are challenging."

Beginning this fall, students will have a brand-new space to design and build award-winning cars.

Funded thanks to a $1.5 million gift from the family of Dana C. Wood, the 7,000-square-foot Dana C. Wood FSAE Racing Lab is now home to the FSAE program, which includes programs for the design and building of a combustion-engine car as well as an electric vehicle. The new space replaces the aging and cramped lab in the basement of the Mechanical Engineering Building.

The new space includes a spacious area to build the cars, as well as house cars from past competitions, a variety of equipment like a driving simulator, a dedicated space for the EV car, design and collaboration space, a composite lab and office spaces.

Russell credits lab manager Michael Arnold for the design, construction oversight and operation of the facility. Arnold joined the program in 2017, coming from a career in the Indy Car circuit working for years with Al Unser Jr., a two-time Indy 500-winning driver. Arnold has implemented important changes in the shop over the years so it is run more like a professional racing team.

"We now have a space that is more advanced than any of our competitors, and that is quite an impressive accomplishment," Russell said. "We'd like to produce not just winning cars but also attract students into the program and the School with a facility that is second to none."

The FSAE programs run largely on donations. To donate to the internal combustion car, go to unmfund.org/fund/formula-sae-team/. To donate to the EV car, go to unmfund.org/fund/fsae-electric-car/.

Solar Splash places third in the nation

It was a long time coming, but that made the victory even sweeter.

After not being able to compete due to the pandemic in 2020, the UNM Solar Splash team was able to travel to Springfield, Ohio, in 2021 and garnered a third-place victory overall in the national Solar Splash contest, held June 8-12. The team also placed second in the sprint event, third place in the slalom and third place in qualifying.

The third-place overall victory was UNM's best overall result since they began competing in 2016. UNM was among nine solar-powered boat teams from colleges and universities around the country to compete. The field this year was considerably smaller, due to several teams having to withdraw because of COVID-19 issues.

The team is led by faculty advisor Peter Vorobieff, professor of mechanical engineering, which he has been leading since UNM began competing in the event in 2016. Despite his continued involvement, he says the team members deserve all the credit, having to design, build and compete in the extraordinary circumstances of a pandemic that has made life challenging on many fronts.

Team members who traveled to competition are engineering students Jennifer Restrepo, Felicia Brimigion, Emilio Martinez, Matthew Aragon and Brandon Kirkpatrick.

In 2019, the team placed fourth overall and won the Teamwork Award for best coordinated group effort.

The team was planning to compete in 2020, then the pandemic forced the closure of labs and the cancellation of the competition. However, the Solar Splash team had still made significant progress before the pandemic and continued that work after the labs opened up again last summer. This resulted in big changes on the boat from the last time they went to competition.

Among the improvements to the boat made in 2020-21 were building a new wooden hull that was designed, built and tested by the team originally led by Karl Foster. Unfortunately, since the 2020 competition had to be canceled, Foster never got to compete. The hull is made out of quarter-inch plywood and coated in fiberglass. It follows an ultra low-drag wavesplitter design, with its shape inspired by Viking longboats and determined by a student team that conducted both numerical modeling and small-scale validation experiments. The team also acquired a more powerful motor to improve sprint times, and received high-performance solar cells from SolAero Technologies to build a new solar array for the boat, much lighter than the 2019 array, putting out 528 watts of power on a sunny day.

Sponsors of the UNM Solar Splash this year were UNM, Sandia National Laboratories, IEEE, ExxonMobil, PNM and the Menicucci family.

Solar Splash is financed largely through donations. To give, go to unmfund.org/fund/solar-splash

Department offers bachelor's program at UNM-Los Alamos

The Department of Mechanical Engineering and University of New Mexico-Los Alamos (UNM-LA) are collaborating to expand an existing two-year pre-engineering program to a bachelor of science in mechanical engineering program on the UNM-LA campus. The program was developed to meet identified workforce needs at the Los Alamos National Laboratory (LANL) but will also provide local students the same opportunity.

UNM–LA Chancellor Cynthia Rooney said while many area students were succeeding in the university's two-year, pre-engineering program, few could overcome the logistical demands of work-life balance and a lengthy commute to complete a four-year degree at the main campus in Albuquerque. LANL Director Thom Mason corroborated that a four-year program at UNM–Los Alamos could be beneficial to Laboratory employees seeking to upgrade their skills while working full time.

Mason said there is high demand for skilled engineers in the face of a changing workforce and the adoption of new initiatives in support of the national security mission. The new technological and scientific landscape will present great opportunities for those hoping to work on the front lines of developing new innovative solutions to the world's most challenging problems. In recent years, the role of engineers in research and development and other areas at LANL has expanded.

"This collaboration is a genuine community effort, spotlighting so many of the foundational values of The University of New Mexico," said UNM President Garnett Stokes. "We're giving students an amazing educational experience and paving the way for a great career. We're working as an entire university system to support, and play off of, the strengths and expertise of our main and branch campuses. And we're creating a pipeline of qualified graduates to meet the needs of a regional employer – who just happens to be one of the most innovative laboratories in the world. This is a local collaboration that can truly change the world."

A pilot program began last year, and even with the challenges of the pandemic, during the spring 2021 semester, a total of forty LANL employees were enrolled in the Mechanical Engineering program:
- 15 in the pre-engineering program through UNM-LA
- 25 in the Bachelor of Science in Mechanical Engineering program taking upper-division courses.

"This program serves as a model for innovation and cooperation – where UNM-LA, a branch campus-community college, works with the School of Engineering on the UNM-Albuquerque campus to serve as partners with LANL to provide the academic preparation needed in the local workforce," Rooney said.

To learn more about the program, contact Dr. Irina Alvestad, UNM-LA associate dean of Instruction and Mathematics and Engineering Division chair at irina@unm.edu.

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Department offers online master's program in space systems engineering

The Department of Mechanical Engineering offers a fully-online master's program in space systems engineering, leading to a master of science in mechanical engineering. This program is one of the first master's-level space systems engineering programs in the country. The space systems engineering concentration was developed to provide graduates with the advanced skills to further their career in the aerospace industry. All courses for the space systems engineering program are offered in an eight-week format.

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The program is ranked No. 1 nationwide in a list of the 2020 Most Affordable Online Master's Programs in Mechanical Engineering by OnlineU. The same program is also ranked No. 1 for the 2020 Most Affordable Online Master's in Aerospace Engineering Programs, and No. 6 for the 2020 Best Online Master's in Mechanical Engineering Degrees.