

**NC State 2023**

Mechanical and Aerospace Engineering



THE

# MAETRIX

# CONTENTS

<b>MAE at a Glance</b>	<b>02</b>
Rankings	02
Population Statistics	03
<b>Update from the Department Head</b>	<b>04</b>
<b>Program Updates</b>	<b>06</b>
Graduate	06
Undergraduate	07
<b>Student Spotlights</b>	<b>08</b>
Kota Research Group Develops Non-Stick Coatings for Biofluid Manipulation	08
Four MAE students selected for 2023 NSF-GRFP	10
Three selected as inaugural MAE Doctoral Students of the Year	14
Doctoral student selected for DoE fellowship for Tethered Coaxial Turbine Research	16
<b>Senior Design</b>	<b>18</b>
Mechanical	18
Aerospace	22
<b>Student Teams and Clubs</b>	<b>24</b>
<b>Faculty</b>	<b>28</b>
New Faculty	30
Faculty Promotions and Awards	31
<b>Alumni Spotlights</b>	<b>32</b>
MAE Alumni Cut Path Forward with Innovative Invention	32
Osizik on legacy, family, and forging the future	34
Grantz flying high for more than 30 years in aerospace	36
Vadlakonda paves way for women in manufacturing	38
<b>Hall of Fame</b>	<b>40</b>
<b>How to Give Back to MAE</b>	<b>41</b>

# MAE

## At a Glance

### Rankings

NC State College of Engineering is ranked **25th** in **Best Engineering Schools for Graduate Students** and **30th** in **Best Undergraduate Engineering Programs**

Mechanical Engineering graduate program is ranked **41st**

Aerospace Engineering graduate program is ranked **29th**

Mechanical Engineering undergraduate program is ranked **25th**

Aerospace Engineering undergraduate program is ranked **in the top 25**

Online Master's in Mechanical/Aerospace Engineering program is ranked **11th**



### Graduate Programs

Total graduate enrollment: **433 students**

Aerospace graduate enrollment: **125 students**

Mechanical graduate enrollment: **308 students**

PhD enrollment: **181 students**

Master's enrollment: **252 students**

Graduate degrees conferred: **99**

Average graduate student GPA: **3.65**

Average GPA for graduate student admission: **3.692**

### Undergraduate Programs

Total undergraduate enrollment: **1,285 students**

Aerospace undergraduate enrollment: **334 students**

Mechanical undergraduate enrollment: **951 students**

Average undergraduate GPA: **3.37**

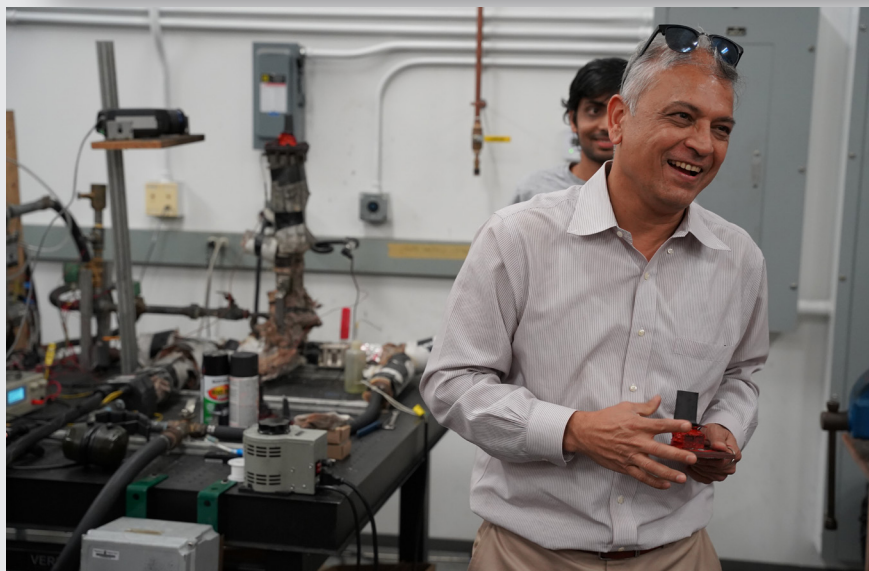
First year MAE intended enrollment: **468 students**

Undergraduate degrees conferred: **326**

Average GPA for undergraduate student CODA admission:

- Average AE CODA GPA: **3.69**
- Average ME CODA GPA (spring 2023): **3.52**





# Update

from the Department Head

Dear Friends, Students, and Alumni,

It has been a great year for the Department of Mechanical & Aerospace Engineering at NC State University. Although the Mechanical Engineering program has existed in some capacity since the very first days of this institution, the NC State College of Engineering celebrated its 100th anniversary in 2023. This marks an entire century of contributions to the local, state and national economies, along with the development and of an extraordinary engineering workforce. Both the university and the college are looking into the next century with a slated expansion of 40% more students. The numbers are driven by a freshman acceptance rate of under 20% currently and a strong interest in our engineering programs. Mechanical and Aerospace Engineering programs are the top choices for the high caliber of students that are attracted to NC State. In a few years, both our ME and AE programs are expected rank as some of the largest programs of their kind in the nation.

Our students continue to soar ahead in national and international competitions. Our undergraduate student teams stand among the most high achieving in the nation. Our students are also winning top notch competitive scholarships like NSF-GRFP and SMART, in addition to best paper awards and poster presentations at conferences. You can read about many of these exceptional student accomplishments in the pages to come.

Our faculty are also continuing their cutting-edge research. We have strong teams working in alternative energy, robotics, advanced sensors and diagnostics, high speed propulsion, biomechanics,

ultrasound applications, and more. Our research expenditures have seen phenomenal growth from \$7.5M in 2017 to nearly \$15M this past year. I'd like to congratulate Dr. Venkat Narayanaswamy for his promotion to Full Professor, Dr. Hao Su for being granted tenure as Associate Professor, and Dr. Felix Ewere for his promotion to Associate Teaching Professor. I'd also like to welcome several new faculty that joined the department in the last year, including Assistant Research Professor Dr. Veeraraghava Raju Hasti, and Assistant Professors Dr. Darius Carter, Dr. James Braun, Dr. Mosi Heiranian and Dr. Donggun Lee. We plan to continue to grow our department faculty size to manage the planned expansion of the college and the department. We also have added several new staff members to the department. Also featured in this magazine are several examples of our faculty's work and accomplishments.

I also want to take this opportunity to thank three outstanding individuals who have been institutions within the department for the past 30+ years and are now retiring or retired. Dr. Jeff Eischen retired in December 2022, Dr. Rich Gould retired in July 2023, and Dr.

Larry Silverberg is on a phased retirement plan starting this Fall. Please join me in congratulating them and recognizing their service to MAE, the College of Engineering, and NC State University.

We hope you enjoy reading about our department and continue to keep yourself updated on our activities. Aside from this magazine, we are constantly updating our website and social media with our departmental news, along with notable updates about our alumni. If you ever want to stop by and visit, please email me at [sekkad@ncsu.edu](mailto:sekkad@ncsu.edu).

Best Regards and Go Pack!

Dr. Srinath Ekkad

*Srinath V. Ekkad*

Department Head and RJ Reynolds Professor



# Program Updates

## Graduate

This academic year has been an active and productive one for the MAE graduate programs and our students. The MAE graduate programs had 362 graduate students enrolled in our department this academic year, consisting of 157 PhD students and 205 MS students. We have also had changes in our graduate program staffing for 2023 as well. Summer Fulcher was promoted into the Graduate Program Manager position. She previously served as the graduate program assistant and will now manage the graduate programs and the office staff. We also hired a new graduate program assistant, Courtney Smith, who will primarily assist with the admissions process.

This year was also an excellent year for external recognition of our MAE graduate students. Three of our current graduate students were awarded the highly prestigious National Science Foundation Graduate Research Fellowship, Jennifer Lee, Jack Turicek and Vinson Williams. Vinson Williams was also selected to receive the highly selective Department of Energy Graduate Student Research Program Fellowship which will support his research at NCSU and during an on-site research residency at the Navy Surface Warfare Center at Carderock. Additionally, Darpan Shukla, a PhD student in Mechanical Engineering, was awarded second place in the annual NCSU Graduate Student Research Symposium amongst the College of Engineering.

As usual we hosted our annual MAE Graduate Research Symposium in March, with poster presentations by 78 PhD students. This is an excellent opportunity to showcase the outstanding quality of graduate-level research within the department and give our graduate students experience in professional communication skills. Two first place poster prizes were awarded to Shyam Prasad V Atri for his poster titled “Computational-Experimental Study on Particle Removal via Electrically Charged Multilayer Nonwovens” and Md Raf E Ul Shougat for his poster titled “Machine Learning Potential of a Lienard Type Oscillator.” Second place poster prizes were awarded to Akash Jerome for his poster titled “Effect of DC Electric Field on Particles Seed Flames” and Saroj Subedi for “Exploring the Potential of the DLP System for Fabricating Sub-100 Micron Features.”

The MAE department also introduced the Doctoral Students of the year award, with three PhD students selected as the inaugural winners for 2022-2023. Trenton Bryce Abbott is a PhD student in Aerospace Engineering investigating the application of computer vision for guided wave damage imaging in composite structures. Mashfiqur Rahman is a PhD student in Mechanical Engineering and is developing a physics-based deep neural network to simulate process of fiber electrospinning. Finally, Harry Schrickx is a PhD student in Mechanical Engineering working on the fabrication and characterization of extremely polarization sensitive photodetectors.

With the recent hires in the MAE department, we expect our research and graduate student numbers will continue to grow in the future and look forward to helping our graduate programs expand.



## Undergraduate



This has been a very eventful year for our undergraduate programs. Our AE and ME programs received very positive reviews from ABET accreditation visit this year. This year also was not an exception as far as the achievement made by our students in the classroom, in student groups and clubs, the recognition of the impact of our students in service and leadership and the growing participation of undergraduate students in research.

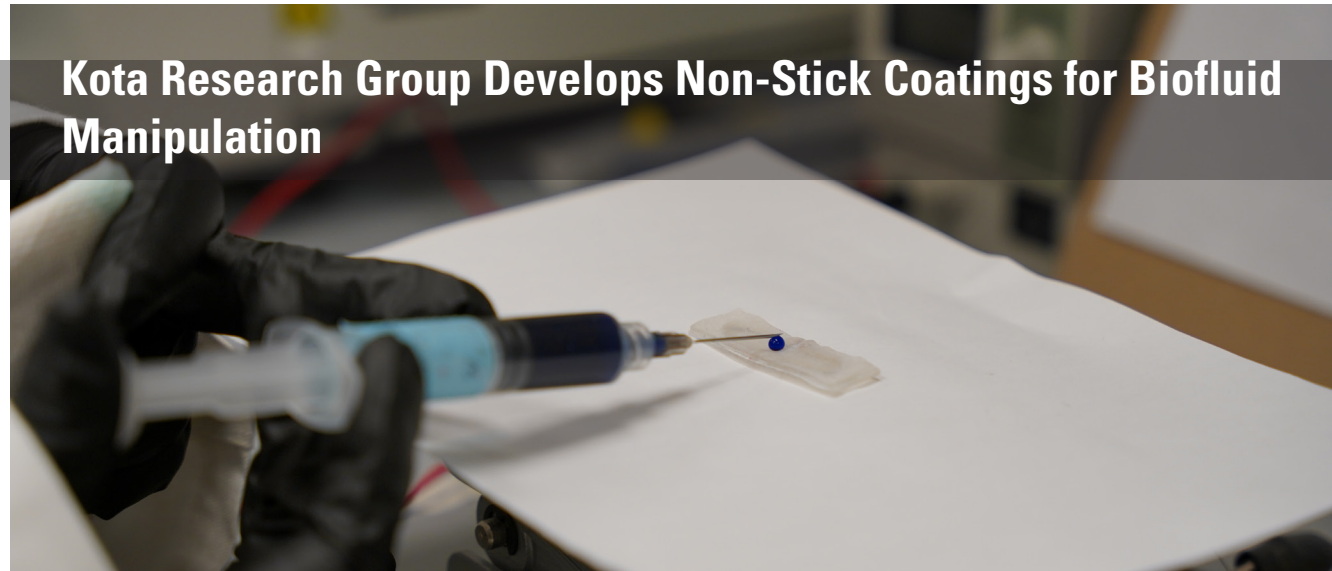
In the classroom, our programs graduated 76 Aerospace Engineering students and 250 Mechanical Engineering students who will fill the ranks of industry, academia, and service. Our graduating class achievements is evidenced by the awards and recognition our students have garnered and the positive visibility to our AE and ME programs. In the brief summary below, we highlight some of the achievements that our students have made this year.

At the College level, Zoe Marazita, a rising senior in Mechanical Engineering has been selected as the 2023-2024 College of Engineering Faculty Senior Scholar. Mechanical engineering student Caleb Jolley was awarded the Engineering Place Exemplary Service Award, which is delegated to one COE student who has demonstrated outstanding service to K-20 education and significantly contributed to the success of The Engineering Place Programs. Mechanical engineering student Carre Horrell was recognized as the recipient of the Erin-Malloy-Hanley Award, which recognizes one scholar who displays outstanding ethical conduct. Other students in our programs have been recognized for their leadership and service this year, including Riley Harrison, Mason Streppa and David Horne.

Also, we have had yet another exemplary year with students' success in receiving NSF Graduate Fellowship Research (NSF-GRFP) awards. Four of our students, two of which are “products” of our undergraduate programs, have received the 2022 NSF-GRFP awards.

Our student clubs also continue to excel and serve as great ambassadors of the MAE department. Details on how these teams performed at national and international competitions this year are featured later in this magazine.

## Kota Research Group Develops Non-Stick Coatings for Biofluid Manipulation



Kota research group from NC State University's Department of Mechanical and Aerospace Engineering has recently published new research related to health care applications of non-stick coatings.

In September, Sravanthi Vallabhuneni, a PhD student in MAE Associate Professor Arun Kumar Kota's research group, published a new research paper in Materials Horizons titled "On-demand, remote and lossless manipulation of biofluid droplets," alongside co-first authors Wei Wang from the University of Tennessee Knoxville and Jiefeng Sun from Colorado State University. The paper was then included in the November issue of Materials Horizons.

Inspired by the sudden surge in health care worker safety concerns caused by the COVID-19 pandemic, the team set out to develop solutions that would mitigate the risk to health care workers when working with potentially harmful biofluid samples like blood, saliva, urine etc. The team utilized soft actuators developed by Jianguo Zhao's research group at Colorado State University to manipulate droplets of biofluids in a lossless manner without human contact.

Herein lies the problem that Vallabhuneni was tasked with solving: How can they manipulate the droplets and leave nothing behind on the actuators (or other surfaces) that could cause harm to health care workers?

With this issue in mind, she set out to develop a superomniphobic coating that could be applied to the soft actuators to prevent any infectious biofluids from being left behind. Superomniphobic refers to the ability of a material that prevents liquids from sticking to it – an ultimate non-stick/slippery

surface.

The way it works, Vallabhuneni's advisor Dr. Kota said, is very similar to an air-hockey table, in which air blows up from small holes in the table to allow the puck to hover or slide across the surface. In the case of Vallabhuneni's coating, however, rather than blowing air, the coating traps air between the surface and the biofluid and simulates the same "hovering" effect that allows the liquid to slip or glide from one point to another without leaving anything behind.



What this means is that while it appears that a droplet sits directly on the actuator, Vallabhuneni says that the droplet only contacts about 1% of the underlying solid surface, while the other 99% consists of air trapped by the coating in the microscopic spaces on the rough surface.

"Utilizing such non-stick soft actuators, we designed manipulators that can automate droplet pickup, transport and release operations required for infectious biofluid handling without human intervention" Vallabhuneni said.

According to Dr. Kota, his research group had no significant experience with biofluids until Vallabhuneni saw the potential for this research to make a difference in the field of health care. Then they sought out experts like Frank Scholle at the NC State Department of Biological Sciences and Ashley Brown at the UNC/NC State Joint Department of Biomedical Engineering to collaborate with and demonstrate the utility of the superomniphobic soft actuators.

With this research, Vallabhuneni has not only made breakthroughs in her own field, but she has also made a dedicated effort to foster the growing culture of collaboration at NC State University.



## Four MAE students selected for 2023 NSF-GRFP

Four students from the NC State University Department of Mechanical and Aerospace Engineering have been selected for the 2023 National Science Foundation Graduate Research Fellowship Program (NSF-GRFP).

According to the NSF Website, the fellowship recognizes and supports outstanding graduate students in NSF-supported STEM disciplines who are pursuing research-based master's and doctoral degrees at accredited US institutions. The five-year fellowship includes three years of financial support including an annual stipend of \$37,000 and a cost of education allowance of \$12,000 to the institution.

"Since 1952, NSF has funded over 60,000 Graduate Research Fellowships out of more than 500,000 applicants," the website states. "Currently, 42 Fellows have gone on to become Nobel laureates, and more than 450 have become members of the National Academy of Sciences. In addition, the Graduate Research Fellowship Program has a high rate of doctorate degree completion, with more than 70 percent of students completing their doctorates within 11 years."

Each year, upward of 12,000 students apply, and only 2,000 are offered the fellowship. From MAE, four outstanding students were awarded the fellowship this year:



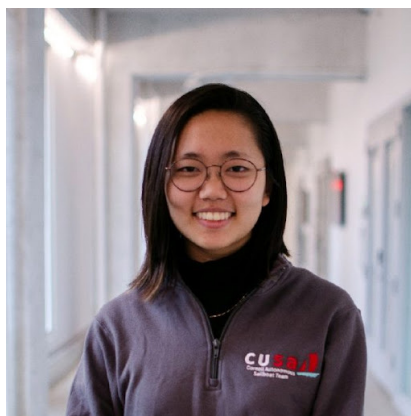
### Chase Jenquin

Jenquin will graduate from NC State with a bachelor's degree in aerospace engineering in May 2023. During his time at NC State, he was part of the University Honors Program and was heavily involved in undergraduate research in Dr. Venkat Narayanaswamy's Turbulent Shear Flow Lab.

His research spanned a wide variety of supersonic aerodynamic research topics including diagnostic development, scramjet inlet testing, and shock-induced flow separation. This research allowed him to closely study high-speed aerodynamics in a variety of contexts. He was able to use

this experience during his summer internship with the Air Force Research Labs which enabled him to explore a number of other exciting supersonic aerodynamic research projects.

After graduating, he plans to attend Purdue University where he will work in Dr. Joe Jewell's research group. During graduate school, he plans to study the interaction of fundamental boundary layer instabilities which will give insight into the mechanisms behind boundary layer transition, a phenomenon responsible for high localized heating that can be detrimental to high-speed vehicles.



### Jennifer Lee

Lee graduated with a bachelor's degree in mechanical engineering from Cornell University in 2022. She is currently a first-year doctoral student at NC State, and she currently works in Andrew A. Adams Distinguished Professor Yong Zhu's Nanomechanics and Nanoengineering Laboratory.

Her research currently focuses on the thermal actuation of soft materials and shape changing behaviors based on heating patterns, and her long-term goal is the development of silver nanowire applications in soft electronics and robotics with potential applications on wearable devices facilitating novel drug delivery and therapeutic strategies.

She will continue to work in the Nanomechanics and Nanoengineering Laboratory as she continues her doctoral studies, contributing to research that aims to address fundamental and applied issues at the intersection of Mechanics of Materials and Micro/Nano-technologies. According to the Lab's website, Nanomaterials exhibit outstanding

material properties as well as well-controlled defect structures and they are interested in understanding mechanical and multiphysical behaviors of nanomaterials.



### Jack Turicek

Turicek completed his undergraduate studies at the Milwaukee School of Engineering before coming to North Carolina State University, where he is a second-year doctoral student studying mechanical engineering.

Turicek is a member of the Multifunctional Composites Group advised by Jason Patrick, who is an MAE Affiliate Faculty Member and an Assistant Professor in the Department of Civil, Construction, and Environmental Engineering. The group designs, fabricates and characterizes synthetic fiber-reinforced composite materials that have unique secondary functions inspired by nature (i.e., thermal regulation, damage sensing, and self-healing capabilities).

Turicek says he is particularly interested in continually building a toolbox of different skills which he can use to solve problems later in his graduate or postgraduate career, making use of a variety of his engineering skills like 3D-printing, composite/polymer fabrication and mechanical testing, optical/uCT scan imaging, and

much more.



### Vinson Williams

Williams graduated from UNC Asheville and NCSU with a joint degree in Mechatronics in May 2021 and he is currently a second-year doctoral student studying aerospace engineering.

He is interested in controls, dynamics, robotics, renewable energy and autonomous systems. He currently works with Dr. Matthew Bryant on the tethered coaxial turbine project, for which they are exploring the physics of energy extraction via two coaxial rotors. Williams says that while the system we are researching is mechanically simple, the dynamics which determine the system's response are highly coupled and nonlinear, which he finds to be the most challenging and interesting aspect of the project.

Williams is already an accomplished researcher, and has published two conference papers, and was recently been selected for the DoE Marine Energy Fellowship. After he graduates, Williams would like to get a few years of industry experience, and then start a mechatronics and autonomous systems engineering contracting firm.







## Three selected as inaugural MAE Doctoral Students of the Year

Three students have been named as the Inaugural Outstanding Doctoral Students of the Year at NC State's Department of Mechanical and Aerospace Engineering.

The award is intended to recognize outstanding doctoral students who have made achievements through scholarly achievement, leadership, research and service. This year, three students were selected based on their astounding impact in each of their fields. These students are Bryce Abbott, Mashfiqur Rahman and Harry Schrickx.



### Bryce Abbott

Abbott began his work with his advisor and MAE's Samuel P. Langley Distinguished Professor, Dr. Fuh-Gwo Yuan, as a sophomore conducting undergraduate research. He has continued to work with Dr. Yuan well into his doctoral studies.

Abbott has been designing and building remote control airplanes and drones since a young age, and he has even built his own pulse-jet engine. Later, during his senior design project, he headed the structural design of a 10-ft sounding rocket with active orientation control.

Abbott's proposed dissertation, "Computer-Vision-Based System for Guided Wave Reconstruction and Damage Imaging in Composite Structures," aims to develop a novel solution to the increasingly important issue of locating subsurface damage in aerospace structures. This process is historically time-consuming and

subjective, which can be costly and pose a significant safety risk, but Abbott is developing an optical method for inspection that will be able to inspect critical structures in seconds to produce a map of any subsurface damage in the structure, essentially, using computer vision to "see the invisible."

While he has already accomplished everything in his dissertation proposal, Abbott has already begun working to optimize his method to become more practical, with greatly improved computational speed. According to Dr. Yuan, these improvements will provide a monumental step towards practical, real-time implementation of guided-wave-based damage imaging that will be integral to the field of aerospace engineering.



### Mashfiqur Rahman

Rahman works in the Porous Media and Multiphase Flow Laboratory with MAE Associate

Professor Dr. Hooman Tafreshi, which conducts computational and experimental research in the field of multiphase fluid mechanics and heat transfer.

Before joining the lab as a doctoral student in May 2021, Rahman was a master's student at Oklahoma State University, where he worked to develop artificial intelligence models for turbulent flows, which yielded a prolific catalog of journal and conference publications on the topic.

In Tafreshi's research group, Rahman is working to develop a physics-based deep neural network (DNN) model to simulate the well-known but unsolved problem of fiber electrospinning, a process by which a direct current (DC) electric field is used to draw and attenuate an electrified polymer jet to form a nanofiber that can be used in applications like tissue engineering or aerosol filtration.

Rahman's model is particularly significant because it blends the speed and versatility of a DNN model with the accuracy of a discrete element method (DEM) model. This work has similarly led Rahman to recently begin coupling his DNN model with the well-known discrete phase model (DPM), which has conventionally been used in simulating particle trajectory in electrohydrodynamic flows. This project is anticipated to greatly contribute to the first-time development of central processing unit (CPU)-friendly simulation

of nanoparticle flows in three-dimensional electrohydrodynamic conditions.



### Harry Schrickx

Schrickx works in the O'Connor Research Group under MAE Professor Dr. Brendan O'Connor, which focuses on the fabrication, characterization and modeling of organic electronic devices.

During the past three and a half years as a graduate student at NC State, Schrickx has contributed and led several research projects, including the authorship of eight peer-reviewed journal publications. He is also currently preparing three additional publications for submission in the coming months. While his papers have only recently been published, they have been cited more than 60 times.

Upon his arrival in the O'Connor Research Group, Schrickx was tasked with developing polarization sensitive organic photovoltaics and he immediately made an impact and advanced the fabrication and characterization of the photodetectors and his work on this topic has since led to the most intrinsically polarization sensitive photodetectors (in any material system) of which the research group is aware.

While working on the

aforementioned project, Schrickx came across an interesting thermomechanical relaxation in many of the polymers he was investigating, and he used this information to uncover a previously unobserved thermotropic liquid crystal phase transition in these materials. O'Connor not only attributes this new research direction in his lab to Schrickx, but also believes that this work will have a resounding impact in the field of organic electronics.



# Doctoral student selected for DoE fellowship for Tethered Coaxial Turbine Research

A doctoral student from NC State University's Department of Mechanical and Aerospace Engineering was selected earlier this month for a highly selective research fellowship with the Department of Energy.

Vinson Williams has been selected as a member of the prestigious DoE Marine Energy Graduate Student Research Program Fellowship, which will support his work both during his studies at NC State and during an on-site research residency at Navy Surface Warfare Center Carderock. Only 3 people in the country were selected for the fellowship in 2022.

Williams works under MAE Associate Professor Dr. Matthew Bryant in the Intelligent Structures and Systems Research Lab (iSSRL), where he worked to develop his proposal for the fellowship: "Dynamic Power Response Modeling for Marine Hydrokinetic Energy Harvesting Underwater Tethered Coaxial Turbines."

"The research Vinson has proposed for this fellowship aims to create the modeling framework necessary to predict and control the operating points of a tethered coaxial turbine in realistic flows that include spatial non-uniformity and time-variation," Bryant said about Williams's research. "While this is a rich and ambitious problem, Vinson's excellent research aptitude has already led to significant progress that lays the groundwork for his successful completion of these aims."

At the iSSRL, Williams contributes to the "Coaxial Water Turbine System Modeling and

Optimization" research project, which ultimately aims to develop methods by which to extract energy from the Gulf Stream, a wide and relatively fast current of warm water passing close to the Eastern seaboard.

"Tethered coaxial turbines (TCTs) consist of two turbines that are attached to the rotor and stator of an electric generator, which is then attached to a tether and moored to the ocean floor," Williams's abstract states. "The turbines counter-rotate in response to flow and extracts energy via the generator. The construction of the TCT would allow the turbine to access the fastest surface flows while being moored to the ocean floor 3000m below. Due to the electromechanical and hydrodynamic coupling between the rotors, the power extraction capabilities of the turbine can be controlled and maximized by changing the characteristics of the generator and the skew angle of the turbine relative to flow."



The Navy Surface Warfare Center Carderock features large-scale towing basins and water channels, which Bryant's research group hopes to use for testing turbine prototypes that they have developed in collaboration with fellow MAE research groups under Dr. Kenneth Granlund and Dr. Andre Mazzoleni.

"Overall, this research works towards proving the potential of this method for power extraction and lays the foundation for the implementation of TCTs as a robust and reliable addition to the American power grid," Williams concludes in his abstract.





# Mechanical

Senior Design



In the 2023 Mechanical Engineering Senior Design course, there were 8 sections comprised of 217 total students.

The students presented and demonstrated their projects across three senior design days, during which each team would pine for the favor of the judges and industry sponsors that would select the winning teams for each project.

Ingersoll Rand was a new Senior Design sponsor this year and they challenged students to design an Inlet Dehumidification System (IDe) for Ingersoll Rand that will operate upstream of the air compressor system to reduce the possibility of condensation forming in the compressor. The design was required to be non-hazardous, quiet and compact. The unnamed first place team in this section was comprised of students Harper McCraw, Matt Rouse, Ethan Kamm, Holden Carroll and Will Philpott.

Daimler Trucks was another new MAE Senior Design sponsor sponsored a project and tasked students with improving safety, ergonomics and efficiency by designing a durable system that would be used in downloading of different cab sizes. Team A, comprised of students Claire Kabrich, Christian Martin, Jinwook Jung, Kyle Dale and Samantha Pendergrass, took first place in this section.

Longtime Senior Design Sponsor John Deere challenged students this year to prototype a lawn mower discharge



chute design that would close off the space between the mower deck and ground when the discharge chute was in the up position, but would allow the mower to operate as normal when the discharge chute was in the down position. The winning team in this section was DeerePack, made up of students Dustin Best, Ethan Garrott, Jason Smith and Jacob Michalowski.

Another returning Sponsor, Pentair, tasked seniors with designing a device that is capable of automatically measuring out and dispensing a particular amount of solid pool chemical into a pool pump return line by the push of a single button, and Pentair plans to integrate the student designs into their current pool pad setup. The Winning team in the Pentair section was Team Vortex.

Another veteran Senior Design sponsor, Caterpillar, asked students to design and manufacture the mounting mechanism for trimble displays. These displays are mounted inside the cab and allow the operator to monitor blade attachments during operations. The requirement of the redesigned mounting mechanism included having the ability to reposition the display in the middle of the door for easy operations and to move it out of sight when the machine was not in use. Team Heimlich was placed first in this section.

The Bob Barker project this year was to design and fabricate a janitorial handle which can be used for cleaning cells and pods in correctional facilities. Further, this handle needs to withstand forces generated during regular cleaning and cannot be used for any malicious intent and purposes. The winning team, The Handle Scandals, was comprised of Dinah Gorodesky, Alondra Martinez-Arroyo, Owen Sondergard, Max Sudderth and Gaoyuan Xu.

The final 2023 sponsored Senior Design project was from Zurn, who asked students to design an automated flow rate control system that utilizes a battery-powered stepper motor to operate a ceramic-cartridge valve. The winning team, Zurn Rush, was comprised of students amon Merritt, Duncan Hinson, Joel Reynolds, Parker Morrison and Zack Hannah.

In addition to the sponsored projects, the Pack Motorsports Formula and Baja SAE teams participated in their own mechanical engineering senior design projects, each of which pertain to a specific portion of their 2023 Formula or Baja vehicles.

The first Baja team Senior Design project consisted of designing uprights for their 2023 SAE competition where design of these uprights is critical as it is a load-bearing member acting as a physical mounting for suspension arms and wheel assembly. 2023's design has achieved required goals of reducing the weights of these uprights considerably without compromising with the strength of the part. Speaking of numbers, they have been able to reduce the weight of the part by 60%.

The second Baja Senior Design project focused on making a 4-wheel drive system which is mandated by SAE for their competitions where this 4-wheel drive system will help in transfer of torque to all 4 wheels for better acceleration and off-road performance. They have designed the system such that this 4-wheel drive system can be engaged/ disengaged when necessary so that when the forward wheels do not need to be active the 4-wheel drive system can be turned off to ensure minimal loss in engine power.

Finally, the Formula SAE Active Thermal Cooling System team designed an active cooling system for the accumulator which is responsible for removing heat from



the battery pack via a working fluid. The project comprises design of plate assembly with milled out surfaces which induce turbulence in the working fluid such that the maximum allowable temperature is 60 degree Celsius. They demonstrated their design by setting up the test bed with all the components in place with temperature sensors which showed promising performance in dissipating heat from the working fluid with minimal pressure loss.

These three designs are all implemented into the 2023 Baja and Formula SAE competition cars.





In the 2023 Aerospace Engineering Senior Design course, there were 11 teams comprised of 73 total students. Three teams were tasked with proposing a realistic and environmentally safe solution to dispose of old rocket and satellite debris using cubesat architecture capable of being launched on a commercial rideshare mission. Three teams built fixed-wing aircrafts and three teams built multi-copter aircrafts, both of which were tasked with Develop a simple, modular aircraft capable of at least two unique tasks to support the North Carolina Forest Service.

One team from each of these three sections was selected by judges as the winners of their respective sections during the annual Aerospace Engineering Senior Design Symposium on Friday, April 7. To win over the judges and show the capabilities of their designs, teams conducted 15 minute presentations in the morning and poster sessions in the afternoon – during which friends, family, colleagues and mentors came out in droves to see the seniors' hard work in action.

Aerospace Engineering Senior Design Instructor Dr. Felix Ewere presented three Awards for Outstanding Project Managers in 2023, which were awarded to three team leads that went above and beyond in the development of their projects. This year's winners were Galen Wilcox of the fixed-wing section, Jorge Francke of the cubesat section, and Andrew Gantt of multi-copter section.

In the spacecraft section, Team Space Raccoons was declared the winner. Their team includes Caden Bjorndahl, Joshua Boyd, Jordan Gonzaga, Jeshua Ray, Parker Rhyne, Olivia Scott, Caden Speakman and Peter Zheng.

In the fixed-wing section, Team LORAX was the winner. Team members included Andrew Burgess, Brian Feddern, Victor Hugo, Blake Monkus, Seth Puckett and Red Ruggiero.

Finally, Team LOCH was declared the winner of the multi-copter section and their team was made up of Katie Curtsinger, Marceli Lewtak, Ethan Sites, Luis Villalobos and Ryan Wagoner.

Another team was comprised of NC State's AIAA Design Build Fly (DBF) Team, whose job was to develop The mission for 2023 is to design, build and test an aircraft to execute electronic warfare (EW) missions. Flight missions included staging of the aircraft, surveillance and jamming. The goal was a balanced design possessing good demonstrated flight handling qualities and practical and affordable manufacturing requirements while providing a high vehicle performance.

Wolfeye was able to compete and fly in the 2023 competition after a catastrophic crash rendered the 2022 DBF team unable to compete. This year's team (comprised of seven senior design students and several undergraduates), successfully completed their ground mission to test for structural deformation by placing weight on fuselage while wingtips are mounted to test fixture, and the first flight mission to complete three laps within the five minutes without carrying a payload. Wolfeye unfortunately crashed on the third attempt of their second mission.

NC State DBF team placed 51st out of about 100 teams overall.

One final team was comprised of the NC State High-Powered Rocketry Team, also known as "Tacho-Lycos," which each year constructs a rocket to compete in NASA's

Student Launch Competition. In 2023, the team (which includes eight senior design students) constructed their 2023 Rocket, which was taken to the compete against other teams from across the country in Huntsville, Alabama on April 15 and 16. Competition results will be announced this Summer.

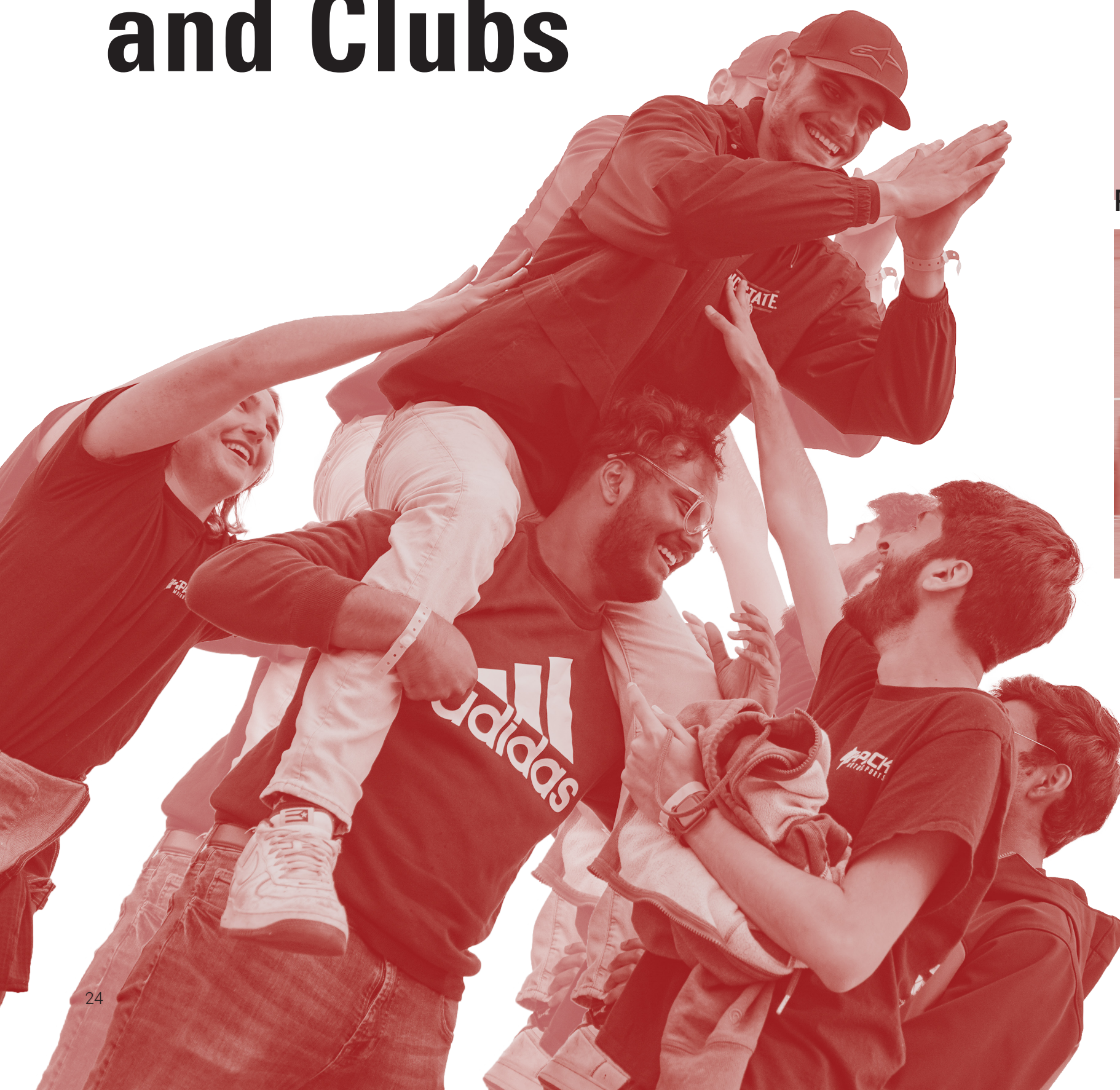


# Aerospace

Senior Design



# Student Teams and Clubs



The Wolfpack Motorsports Baja SAE team competed in two SAE competitions in 2023, Baja SAE Oshkosh and Baja SAE Oregon.

Oshkosh  
May 4-7

12th overall out of 82 total teams

5th in acceleration

9th in maneuverability

14th in suspension and traction

18th in design

27th in sled pull

Oregon  
May 31-June 3

12th overall out of 86 total teams

9th in endurance

6th in acceleration

12th in hill climb

13th in maneuverability

16th in rock crawl

## Pack Motorsports Baja SAE



The Wolfpack Motorsports Formula SAE team competed in one SAE competition in 2023, Formula SAE Michigan.

Michigan  
May 17-20

29th Overall out of ~90 total teams

4th in Acceleration

13th in Skidpad

12th in Autocross

8th in Design

## Pack Motorsports Formula SAE



NC State's AIAA Design Build Fly (DBF) Team competed in the 2023 DBF competition after last year's team was unable to compete due to a catastrophic crash prior to the competition.

AIAA Design, Build, Fly (DBF)  
2023, April 13-16

51st Overall out of 100 total teams



NC State High-Powered Rocketry Club, also known as "Tacho-Lycos," competed in the annual NASA Student Launch competition.

NASA Student Launch  
2023, April 15

1st in Best-Looking Rocket Award

2nd in the Social Media Award

4th Overall out of 51 total teams

## High-Powered Rocketry

The NC State University solar vehicle team, SolarPack, did not participate in the 2023 Formula Sun Grand Prix this year so they could resign and begin construction on their entirely new vehicle, moving away from the long-standing refurbished Volkswagen design.



## Solarpack



The Aerial Robotic Club at NC State competed in the 2023 Association for Unmanned Vehicle Systems International Student Unmanned Aerial Systems (AUVSI SUAS) competition.

AUVSI SUAS 2023  
April 15

29th Overall out of 72 total teams

29th in Presentation Score

2nd in Mission Demonstration

## Aerial Robotics





# Faculty

**Sajjad Bigham**  
Associate Professor

**Matthew Bryant**  
Associate Professor

**Gregory Bucker**  
Professor

**Mingtai Chen**  
Assistant Teaching Professor

**Tarek Echehki**  
Associate Department Head

**Jack Edwards**  
Director of Aerospace Research

**Srinath Ekkad**  
Department Head

**Felix Ewere**  
Associate Teaching Professor

**Tiegang Fang**  
Professor

**Scott Ferguson**  
Associate Professor

**Ashok Gopalathnam**  
Professor

**Landon Grace**  
Associate Professor

**Kenneth Grandlund**  
Associate Professor

**Tim Horn**  
Assistant Professor

**Anna Howard**  
Teaching Professor

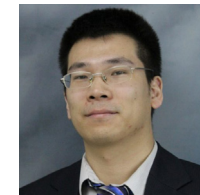
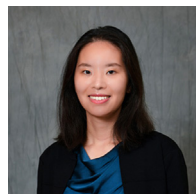
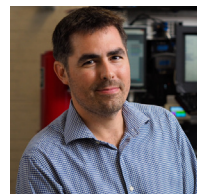
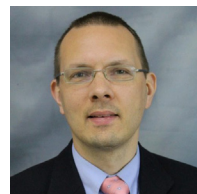
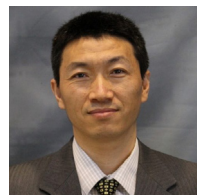
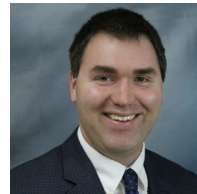
**Jingjie Hu**  
Assistant Professor

**Hsiao-Ying Shadow Huang**  
Associate Professor

**Xiaoning Jiang**  
Dean F. Duncan Distinguished Professor

**Arun Kumar Kota**  
Associate Professor

**Andrey Kuznetsov**  
Professor



**Andrew Lee**  
Assistant Professor

**Jun Liu**  
Associate Professor

**Hong Luo**  
Professor

**Kevin Lyons**  
Professor

**Andre Mazzoleni**  
Professor

**Nancy Moore**  
Associate Teaching Professor

**Marie Muller**  
Associate Professor

**Venkat Narayanaswamy**  
Professor

**Gracious Ngaile**  
Professor

**Brendan O'Connor**  
Professor

**Mark Pankow**  
Associate Professor

**Kara Peters**  
Associate Department Head

**Afsaneh Rabiei**  
Professor

**Jong Eun Ryu**  
Assistant Professor

**Katherine Saul**  
Professor

**Alexei Saveliev**  
Associate Professor

**Larry Silverberg**  
Professor

**Hao Su**  
Associate Professor

**Hooman Tafreshi**  
Associate Professor

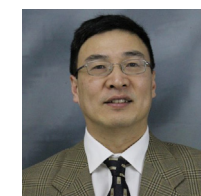
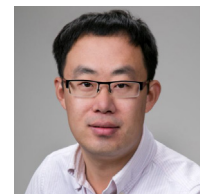
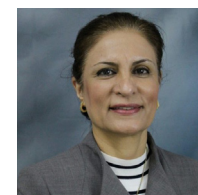
**Chau Tran**  
Associate Teaching Professor

**Cheryl Tran**  
Director of Undergraduate Advising

**Jay Tu**  
Professor

**Henry Ware**  
Assistant Professor

**Fen Wu**  
Professor





# New Faculty

**Liming Xiong**  
Associate Professor



**Cheryl Xu**  
Professor



**Chi-An Yeh**  
Assistant Professor



**Jie Yin**  
Associate Professor



**Fuh-Gwo Yuan**

Samual P. Langley Distinguished Professor

**Mary Zadeh**

Assistant Teaching Professor



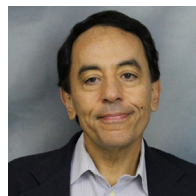
**Yong Zhu**

Associate Department Head for Research

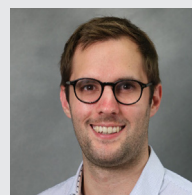


**Mohammed Zikry**

Zan Prevost Smith Professor



**James Braun**  
Assistant Professor



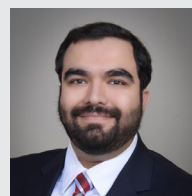
**Darius Carter**  
Assistant Professor



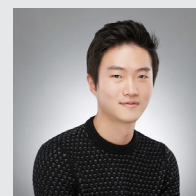
**Veeraraghava Raju Hasti**  
Assistant Research Professor



**Mosi Heiranian**  
Assistant Professor



**Donggun Lee**  
Assistant Professor



# Faculty Promotions and Awards

**Dr. Venkat Narayanaswamy** has been promoted to Full Professor

**Dr. Hao Su** has been granted tenure as Associate Professor

**Dr. Felix Ewere** has been promoted to Associate Teaching Professor

**Dr. Katherine Saul** was selected by the Kern Entrepreneurial Engineering Network (KEEN) as a 2022 Engineering Unleashed Fellow. She has also been inducted into the 2022 class of the Athletics Hall of Fame the weekend at her alma mater of Brown University and was included among the 2022-23 NC State University Faculty Scholars.

Samuel P. Langley Distinguished Professor **Fuh-Gwo Yuan** has been selected as the winner of the 2023 Society of Photo-Optical Instrumentation Engineers (SPIE) Nondestructive Evaluation (NDE) Lifetime Achievement Award.

**Dr. Venkat Narayanaswamy** has been elected as an Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA).

**Dr. Hao Su** has received a Distinguished Switzer Fellowship from the Administration for Community Living's (ACL) National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR).

Department Head and RJ Reynolds Distinguished **Professor Dr. Srinath Ekkad** received the prestigious ASME Heat Transfer Memorial Award. He was also elected a Fellow of the Royal Aeronautical Society (FRAeS).

**Dr. Afsaneh Rabiei** has been named a Senior Member of the National Academy of Inventors (NAI). She was also among 2023-24 NC State University Provost's Faculty Fellows.

Researchers from **Dr. Jie Yin's** research group developed a paper that was selected by the Editorial Board of the Proceedings of the National Academy of Sciences (PNAS) as one of six papers published by PNAS in 2022 to receive the prestigious Cozzarelli Prize.

**Dr. Jingjie Hu** was awarded one of the five 2022 Haythornthwaite Foundation Research Initiation Grants.

**Dr. Tim Horn** was selected as one of the NC State University 2022-23 Goodnight Early Career Innovators.

**Dr. Ashok Gopalathnam** received the NC State University Alumni Distinguished Undergraduate Professor Award for the 2022-23 academic year.

**Dr. Jun Liu** was one of only three in the College of Engineering to receive the Outstanding Teacher Awards for the 2022-23 academic year.

**Dr. Felix Ewere** was selected as the recipient of the Engineering Place Outstanding K-12 Outreach Collaborator Award.

**Dr. Marie Muller** was selected for the Most Supportive Faculty/Staff Award of the Woman and Minority Engineering Program Awards.



## MAE alumni cut path forward with innovative invention



Three MAE alumni are laying the groundwork for the future of the manufacturing industry with a new innovative invention intended to make CNC automation more compact and user-friendly than ever before.

Sam Marcom, Dario Muller and Josh Cooper, all of whom graduated with their bachelor's degrees in Mechanical Engineering, met during the 2021 Fall Semester in their Engineering Entrepreneurs Program (EEP) senior design course. Over the course of the past two years, these three students not only became close friends, but also started their own business following the invention of a new manufacturing tool: the CN-Seamless.

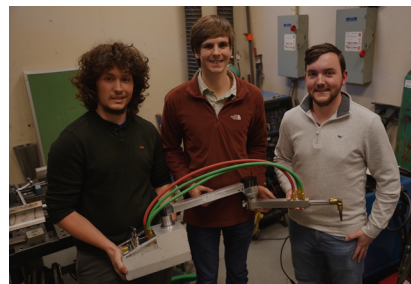
Marcom, now an NC State Electrical Engineering Master's Student, first saw the need for a new solution in CNC Automation while working at a steel mill in Virginia the summer before he began the EEP course.

"They were always fabricating stuff out on the floor, so there was stuff that would break all the time; and it was big, heavy steel stuff; and they spent hours marking stuff out with a pen and paper and a ruler and

they'd cut it all by hand." Marcom said during an interview in January. "I thought 'well, they should have a machine to do this.'"

According to Marcom, many companies; like the steel mill where he worked; have large plasma table machines that can offer some support in situations such as these, but they large, immobile, and oftentimes unfeasible when a game-time fix is needed on the shop floor.

Enter the CN-Seamless, a lightweight and entirely mobile CNC oxy-acetylene torch cutting product that Marcom, Muller and Cooper believe could revolutionize the fabrication process. Complete with an electromagnet base that mounts directly to any steel workpiece, tunable gas control that streamlines finding the perfect fuel ratio, and a user-focused



touchscreen controller; the CN-Seamless is intended to be a tool that anyone can learn to use and implement into their workshops or on the jobsite in a matter of hours.

Cooper, who has now also earned his Master's in Mechanical Engineering, had reservations at first about undertaking the development of this new ambitious tool, and he was not the only one.

"I was skeptical because you have to look at feasibility as one of the categories," Cooper said. "We're basically going to take a plasma table, shrink it, make it better, and make it something anyone can use with a great user experience – the feasibility was questioned, and when we had to present in class, that was one of the biggest pieces of feedback we got: 'this would be great if we could do it, but can you do it?'"



But do it they did.

In January of 2022, the team began building the first model of the CN-Seamless, and in about two months they had created a rough prototype. During a second prototyping phase, the team was able to solve several of the initial prototype's shortcomings, and in September of 2022, the team began work on the now-complete and fully functional Mach 1 version of the CN-Seamless product.

The team particularly credits EEP Director Marshall Brain for his influence on the development of the CN-Seamless and for pushing the team to go beyond their comfort zones to develop a truly professional product that has the potential to greatly benefit the manufacturing industry.

"He's the soul of that class," Cooper said. "We wouldn't be anywhere close to where we are now without his guidance."

Muller, who is also now an Electrical Engineering Master's Student with Marcom, said that the user-friendly nature of the CN-Seamless is what sets it apart from the competition and positions it at a unique advantage compared to similar products.

"Whenever you pick this machine up, the first thing you're going to touch will be the user interface, so we want to build a user interface that integrates with the rest of the machine and how somebody who does things by hand thinks," Muller

said. "That's what's really not on the market right now."

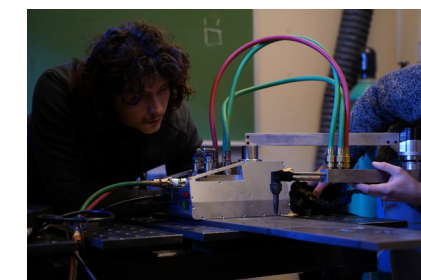
In addition to its small frame and durable design, the CN-Seamless weighs in at approximately 25 pounds, as opposed to similar products on the market that can be 200 pounds or more.

The idea is that fabricators and machinists will be able to reach for the CN-Seamless like they would a drill or a hammer, just another tool that helps get the job done quicker and better than ever before.

"The idea at the end of the day is to make this a seamless tool that helps workers in the field," Muller said. "Rather than trying to replace them or completely change the market, we're really trying to add something that people can rely on as their assistant."

Now, the team is preparing to sell the CN-Seamless Mach-1 product program and eight companies have already signed letters of intent to purchase, including the steel mill where Marcom first began to develop the idea for the product.

The team hopes to have the Mach 1 units complete by March, when they will be sent to the companies to have on-site for six months, at the end of which they will be replaced by the complete final production of CN-Seamless units that have been fine-tuned by industry feedback during the Mach 1 period.



During the Mach 1 feedback collection period, the team also hopes to gauge interest in different attachments for the CN-Seamless to make it a truly modular experience where the user can go from using the original oxy-acetylene torch cutter to a plasma cutter or even a 3D-Printing attachment in just a matter of minutes.

The epitome of the entrepreneurial spirit, each of the three team members have all fully committed themselves to the CN-Seamless, and they continue to be laser-focused in making it the best product it can be, going great lengths and working long hours to ensure they are doing everything they can to perfect their design.

Cooper lives and works in Winston-Salem and commutes to Raleigh to work with his teammates, and he says what drives this endeavor to be successful is not only the drive, skills and knowledge that the team employs, but also the friendship they share between them.

"Sure, we're coworkers at this point. We have a company, we have a website, we're incorporated – we're doing the thing – but we're also really close friends," Cooper said. "We hang out, we enjoy each other's company, and this wouldn't work if I didn't like hanging out with these guys. That's definitely critical to our story."



## Ozisik on legacy, family and forging the future



For Hakan Ozisik, the Department of Mechanical and Aerospace Engineering at NC State University has been a second home for almost his entire life. Now, he is helping to lay the groundwork for the future of the department and the success of its students.

Ozisik earned his bachelor's, master's, and doctoral degrees in Mechanical Engineering from MAE in 1982, 1986 and 1989, respectively; but his involvement in the department began many years earlier when his late father, internationally recognized heat transfer expert Dr. M. Necati Ozisik, joined the MAE faculty in 1963.

"NC State University has always been there for me at least peripherally," Ozisik said during an interview in December 2022. "I've been around the department in one capacity or another my whole life – from picking my father up from work years ago to keeping up with Wolfpack sports to this day. But I think now it's time for a different level of involvement."

### A legacy of greatness

Not only was Ozisik a 2022 MAE Alumni Hall of Fame Inductee, but he was also the Fall 2022

MAE Graduation Commencement Speaker. Now, he has established a Distinguished Lecture Series with the department in honor of his father, who continued to make extensive contributions to MAE after his retirement to professor emeritus in 1993.

Necati Ozisik was the primary advisor for more than 45 doctoral students at NC State, many of whom are now established leaders in industry and academia. He was an internationally known authority on the subject of Heat Transfer, publishing 11 books and more than 270 research papers. He was an elected Fellow of the American Society of Mechanical Engineers and the recipient of numerous prestigious awards recognizing his teaching and research excellence, including the Oliver Max Gardner Award (1985), the ASME Heat Transfer Memorial Award (1987), the North Carolina State University Alumni Distinguished Graduate Professors Award (1989), and the Alexander Quarles Holladay Medal for Excellence (1992).

According to Hakan Ozisik, he has wanted to honor his father's work with the department in some capacity for quite some time and he was shocked and delighted

at the number of people who regaled him with tales of the elder Ozisik's mentorship and instruction during the Hall of Fame induction ceremony in November 2022. He knew it was time to create a lasting impact in his father's name.

"This is the right thing to do," Ozisik said. "It's time."

The inaugural installment of the Dr. M. Necati Ozisik Distinguished Lecture Series, titled "Solution of Inverse Problems in Thermal Systems: A Tribute to Professor Necati Ozisik," was delivered in April 2023 by longtime friend and colleague of Necati, Board of Governors Professor at Rutgers University Dr. Yogesh Jaluria.

### Back to basics

Much like his father, Hakan Ozisik has also led a long career marked by success and achievement in the engineering industry.

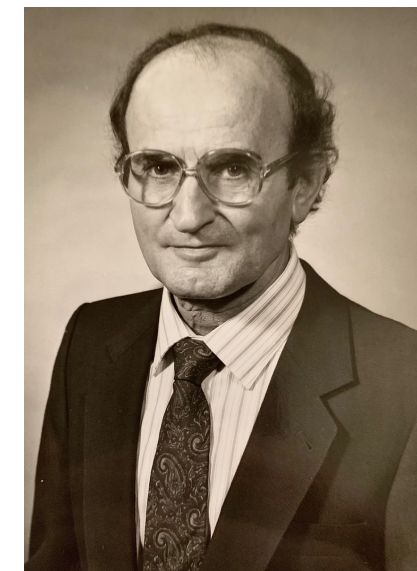
After completing his doctoral degree, Ozisik worked as a Postdoctoral Research Associate at NC State University's Center for Sound and Vibration, after which he began a 28-year-long career with the Aerospace Corporation, where he worked on various aspects of

space and launch in support of National Security Space.

In 2006, he was selected as the System Director accountable for the successful final test and fly-out of the remaining GPS (Global Positioning System) IIR/IIR-M satellites. In 2008, he became the System Director for the GPS III Satellite Bus and was later appointed the GPS III Chief Engineer. In that role, he worked closely with his engineering teams, and prime and subcontractor teams, and served as a trusted technical advisor to the Government and Air Force during all development phases through final delivery for launch. Throughout his storied career, he developed extensive experience in the test, analysis, design and development of space-qualified hardware from both a technical and programmatic perspective.

According to Ozisik, the fundamentals that led to his career and the many successes throughout, are the same engineering building blocks that are still taught at MAE to this day.

"The curriculum might as well look exactly the same," Ozisik chuckled. "The course names are



pretty much the same – so the fundamentals aren't changing, they're the same courses. What is changing, and what I see here, is the technology and the complexity of the things that these students are able to do."

Ozisik remarked that MAE students today are given the tools and education to graduate college as exceptional engineers who are ready to solve the world's latest and greatest problems, but it is their own interest and passion for engineering that guides them to become truly celebrated and esteemed members of their professional communities, much like Ozisik and his father before him.

"What I've noticed being around the department's students recently is that everyone's just so enthusiastic," Ozisik said. "It's that enthusiasm that will really matter throughout their careers."

According to Ozisik, young engineers should undertake the mindset that they will always be learning. He said the engineering fundamentals have not changed since his own schooling, and it will always be important to remember the basics; but a constantly evolving world with constantly evolving technologies and problems requires young engineers whose enthusiasm pushes them to adapt to the changing tides and create new and innovative solutions to benefit the world around them.

Despite all the successes in his career and in engineering as a whole, Ozisik said what he is most proud of in his professional life was his ability to learn to expand his interests.

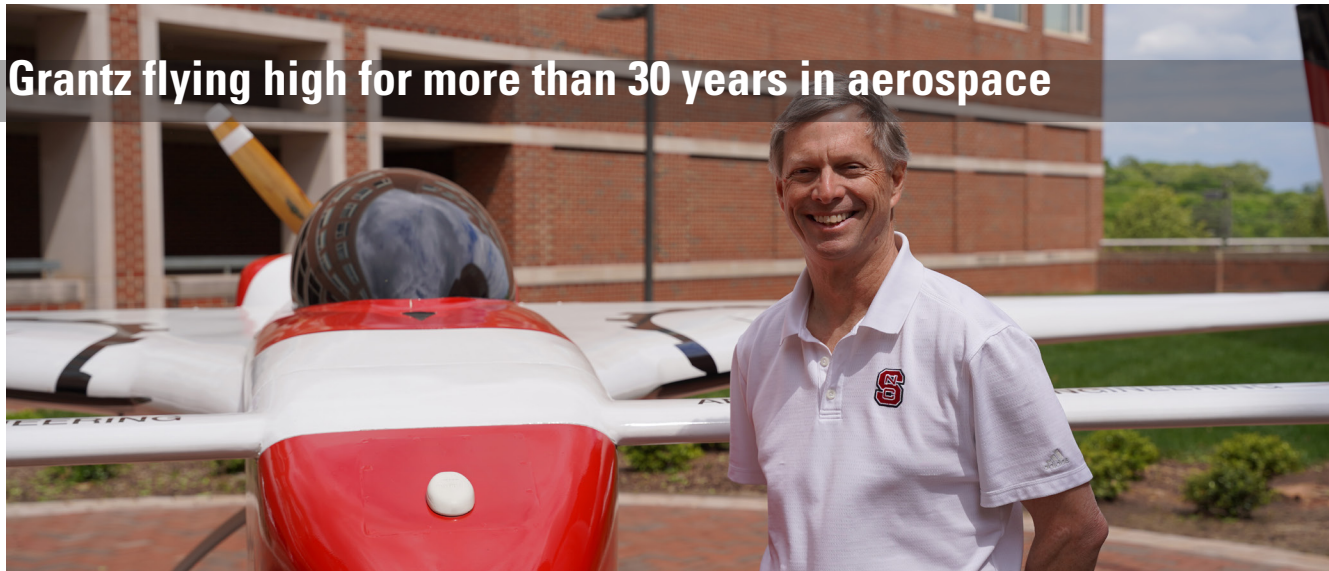
"To expand out and be able to do different things is so important," Ozisik said, encouraging young

engineers to keep an open mind about their careers. "Getting out of core engineering and going into what I call program management was huge for me because it changed everything, and it opened up my whole future... It's something I never thought I would be doing, and it really is satisfying."

With the establishment of the Dr. M. Necati Ozisik Distinguished Lecture Series and his continued involvement with the department, Ozisik is determined to benefit the lives of MAE students. He hopes to help bolster their careers and greater lives, not only by instituting educational resources such as the lecture, but also by instilling a sense of curiosity and community among the young engineers of today.



## Grantz flying high for more than 30 years in aerospace



Aviation runs in the family for the Grantz's. For 1989 MAE doctoral alum Arthur (Art) Grantz, the sky was often more his home than the ground below.

"Whenever we took vacations as a family, we would never drive a car," Grantz said remembering his and his father Walter's shared love for flying. "We'd always fly a plane."

### Raised in the Clouds

All throughout Grantz's teenage years, he flew planes with his father out of Patrick Henry International Airport in Newport News, Virginia, beginning a love for aviation and laying the foundation for his eventual star-studded career in Aerospace Engineering. According to Grantz, he grew up spending his free time sailing in the Chesapeake Bay, but when he spent time with his dad, they were almost always in the air.

"The big thing I would do with my dad was fly," Grantz said. "We would enjoy doing loops and rolls and spins and all kinds of aerobatics, but really it was about getting to spend time with each other."

Eventually, the Grantz's love for aviation led Walter to build his own aircraft. Completing the project in 1991, Walter constructed a Long-EZ tandem two-seater powered by a Lycoming O-235 engine. The craft has a swept main wing with root leading-edge strakes and winglets, foam-fiberglass sandwich composite structure and a "canard" front wing that makes the plane stall resistant.

Walter Grantz passed away in 2018 and requested the plane be donated to a university to help inspire other young engineers. Grantz and his mother Barbara arranged his father's wishes in collaboration with MAE, and the craft now sits prominently between Engineering Buildings 2 and 3.

To this day, Grantz carries on his father's legacy in the skies and is an instrument rated private pilot with power and glider ratings, and his sons have even adopted the aerospace engineering and aviation gene passed down from Walter, one working at Northrop Grumman in solid rocket motor dynamics, and the other working with Boeing Research and Technology in software for

autonomous systems.

### A Career Among the Stars

Crossing the skies with his father was only the beginning for Grantz, and for nearly 35 years now he has been involved with the development of reusable launch vehicles and spacecraft concepts.

He currently works as the Director of the Experimental Systems Group (ESG) within Boeing Space Mission Systems. According to Grantz, The ESG organization designs, builds, and supports the operation of a portfolio of proprietary spacecraft and associated technologies used across the Boeing Company.

As the Flight Sciences Lead and later the Chief Engineer, he led the configuration development of the X-40A prototype, the X-37 Approach and Landing Test Vehicle, and the X-37B Orbital Test Vehicle, which he and his team developed and operate. The X-37B was developed for the US Air Force and is the first reusable spaceplane that can perform long duration missions in low Earth orbit, return experiments to the

ground for inspection, and then fly again with a new set of experiments. The X-37B program has successfully completed six flights and was the recipient of the 2019 Collier Trophy for changing access to space and serving as the nation's workhorse in space experimentation and technology.

Alongside his exceptional track record as an engineer marked by his many technical contributions and successes, his past work has included aerodynamics, aerothermodynamics, scramjet propulsion integration, and configuration development for the National Aero Space Plane program and other hypersonic test vehicles. He was awarded Engineer of the Year for Space and Intelligence Systems in 2010. He was the 1992 Rockwell Engineer of the Year for advancing hypersonic aerodynamic technology and received the 1990 Gene Zara Award for outstanding contributions to the National Aero Space Plane (NASP) team.

### Soaring Toward the Future

A 2019 MAE Alumni Hall of Fame inductee and commencement speaker for the Spring 2023 MAE Graduation Ceremony, Grantz's legacy in the department speaks for itself, and his connections with other MAE greats like the late former Department Head Dr. Fred DeJarnette and faculty titan Hassan A. Hassan mark some of his most valued memories from his time at MAE.

Grantz attributes his early interest in the concepts that would become his specialties and eventually his whole career to the interactions he shared at the

department, and the research he was able to conduct with the other brilliant aerospace professionals around him.

"I loved working for Dr. DeJarnette, he was wonderful," Grantz said. "But Dr. Perkins, and Scott McCrae and Dr. Hassan – they were all great professors and they gave me a wonderful and well-rounded education in hypersonics, highspeed aerodynamics, aerothermodynamics; the things I was really going after."

According to Grantz, it is this foundation that continues to propel his work forward and keep him engaged with the rapidly evolving aerospace industry to this day, even allowing him to feel the same kind of thrill and fun he felt flying with his father as a young man.

"The nice thing about the kind of work I do is that it's always changing – I'm always learning – and because I'm always learning, it continues to be fun. I want things to be different and challenging and stimulating, and fortunately space is a really growing domain and what we're able to do in space is continuing to

evolve and grow and it is really fun."

Despite his many accolades and great success in his craft, Grantz attributes a great deal of his satisfaction with his work and career to the exceptional team he has surrounded himself with over the years – and he hopes to impart this satisfaction on the next great generation of engineers to follow him, his own two young sons included among those ranks.

"The satisfaction of seeing the people around you succeed and enjoy what they're doing as a group, as a team, as a family – we're able to accomplish some pretty incredible things together," Grantz said. "That's a big part of what I want to tell students: there's a technical aspect to your schooling and your career, but it's how you interact with the people around you that's going to make the difference."





## Vadlakonda paves way for women in manufacturing



In the historically male-populated field of engineering, one MAE alumna is making waves in the manufacturing industry to be the kind of role model she wishes she had growing up.

Rashmi Vadlakonda, who earned her master's degree in mechanical engineering at NC State University in 2018, says one of her biggest priorities as an engineer is to guide and inspire more young women in STEM.

"You can't be what you can't see," Vadlakonda said during a spring 2023 interview. "What we need are female students to see someone like them so they can believe they can do it."

Vadlakonda currently works in Columbia, South Carolina as a Manufacturing Engineer with Ireland-Based manufacturing company Trane Technologies, where she has played a vital part in the company's integration of 3D printing technology at its manufacturing facilities and engineering centers.

As an industry professional, she believes that manufacturing companies need to reinvent themselves using the latest

technologies to stay relevant and competitive. In the interest of that belief, she is preparing to return to an industry 4.0 strategy role in the coming years, meaning she will work in the areas of automation, digitization and cloud/AI technologies. I

Vadlakonda is currently transitioning to a new role, in which she will be a part of the SMART team which is focused on implementing state of the art MES (Manufacturing Execution System) software in their facility.

She has forged a path for herself in the manufacturing industry, achieving renown as a leader in her field and even being selected by the Manufacturing Institute as one of the 2023 Women MAKE Award Emerging Leaders. The awards are intended to celebrate women in science, technology, engineering and production careers who exemplify leadership within their companies. Additionally, the highly selective group of 30 Emerging Leaders aim to recognize women under the age of 30 who have achieved unique accomplishments at the start of their careers.

Vadlakonda serves as Vice Chair of Women in Manufacturing's

(WiM) South Carolina chapter and is a member of the WiM Internal Steering Committee for Trane Technologies.

"We are trying to build a manufacturing community that can support and encourage women in this field, and really bring together all of the manufacturing people in the state because we all want to grow as a community," she said.

She also works with Women in 3D Printing, an organization dedicated to supporting women in the additive manufacturing field, where she served as a co-lead for their mentorship program.

In keeping with her predilection for guiding the young engineers and STEM professionals, Vadlakonda also works with Project Scientist, where she coordinates hands on experiences at STEM summer camps for young women ranging in age from six to 18.

"It is very challenging to explain technology or a concept like 3D printing to a group of 6-year-old girls," she said. "I actually used a unicorn rainbow cake as an example to explain to them kind of how it works – they were so excited."

The list of organizations in which Vadlakonda is involved goes on, and her work with these groups is almost always geared toward inspiring and encouraging the next generation of female engineers and providing them with the tools they need to be successful.

According to Vadlakonda, she might not be where she is today without the support of her family, a kind of support she aims to impart on the many young women she mentors.

"Growing up, watching my parents and family, watching them do what they do was a big influence," she said. "I talk to a lot of parents as part of my volunteering and I tell them that the reason that I have been able to take risks and be ambitious is because my parents always told me 'just go for it, we are always here to catch you' – and that's what parents or friends or family can do for somebody – just give them that safety net so younger people can really aim big and take those risks."

Before Vadlakonda could become the industry leader and mentor that she is today, she had to take a take many big risks, one of which was her decision to move to the United States to pursue her master's degree at NC State, a decision she made for a number of reasons.

"The silliest of those reasons being that red is my favorite color," she joked.

In truth, Vadlakonda was drawn to the City of Oaks by the composite materials research of MAE faculty like Afsaneh Rabiei and Mark Pankow along with state-of-the-art manufacturing facilities like the Center for Additive Manufacturing and Logistics (CAMAL) and an electron beam 3D printing machine, which was the first device of its kind at a University in the United

States.

Upon her arrival, just 22 years old and alone in an entirely new country, Vadlakonda was feeling the weight of the risk she took in coming here, but she said that any doubt quickly dissipated after finding a place where she could thrive within the NC State community.

"What makes you feel at home is the community around you," she said. "At NC State, I felt like a I really found that community. Everybody is so ambitious and nice, they want to collaborate and make better – we really do Think and Do here."

Eventually, Vadlakonda worked an internship at Oak Ridge National Laboratory, where she more deeply involved with her primary passion and what she refers to her first love: 3D-Printing, an industry in which she has now become a rising star, and for which her interest first began during her undergraduate studies when she began research on both 3D and 4D printing.

But Vadlakonda's best is still yet to come, and she is more committed than ever to not only the advancement of 3D printing and the manufacturing industry, but also to the guidance and mentorship of young women that will be the next generation of great engineers.

According to Vadlakonda, the future success of her industry and the greater engineering world lies with young people who are interested in STEM and she hopes to guide and inspire as many young women of color as possible to act on those interests and not only contribute to, but lead the conversations on how to take on the world's greatest problems.







Rebecca Ahne • Dr. Yunus Cengel • Derrick Cheston  
Dr. Dean Eklund • Dr. Bruce Owens • Dr. Hakan Ozisik • Mr. Dennis J. West  
Mr. Bill Wood • Mr. Jeff Richardson

# hall of fame 2022

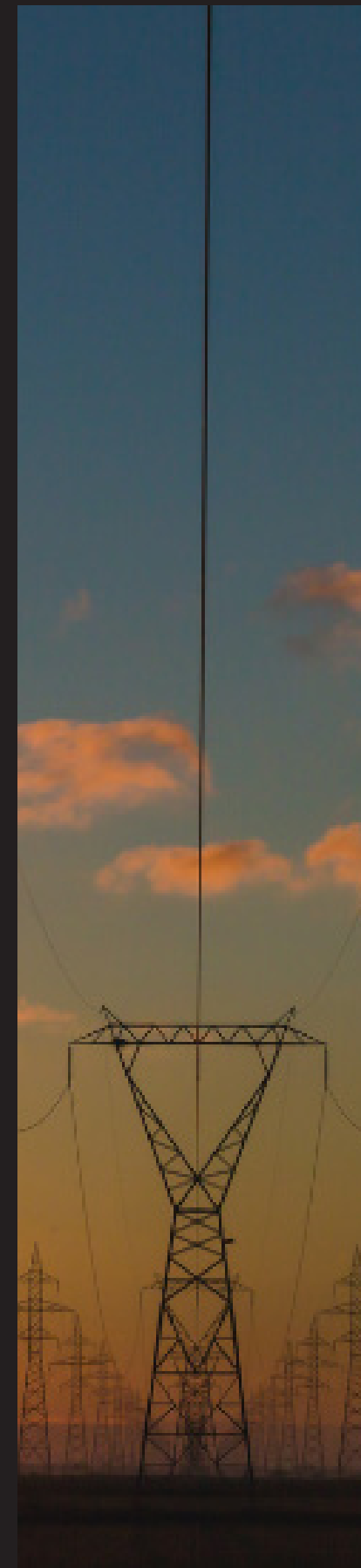
Built upon their common educational foundation at NC State University, The MAE Alumni Hall of Fame was established in 2012 to inspire our current students, and to celebrate the accomplishments of our extraordinary graduates who have used their education to excel in a profession, career, or service. This nomination is based on professional and service achievement, entrepreneurship, and contributions to professional societies making this a truly noteworthy distinction.

## How to Give Back to MAE

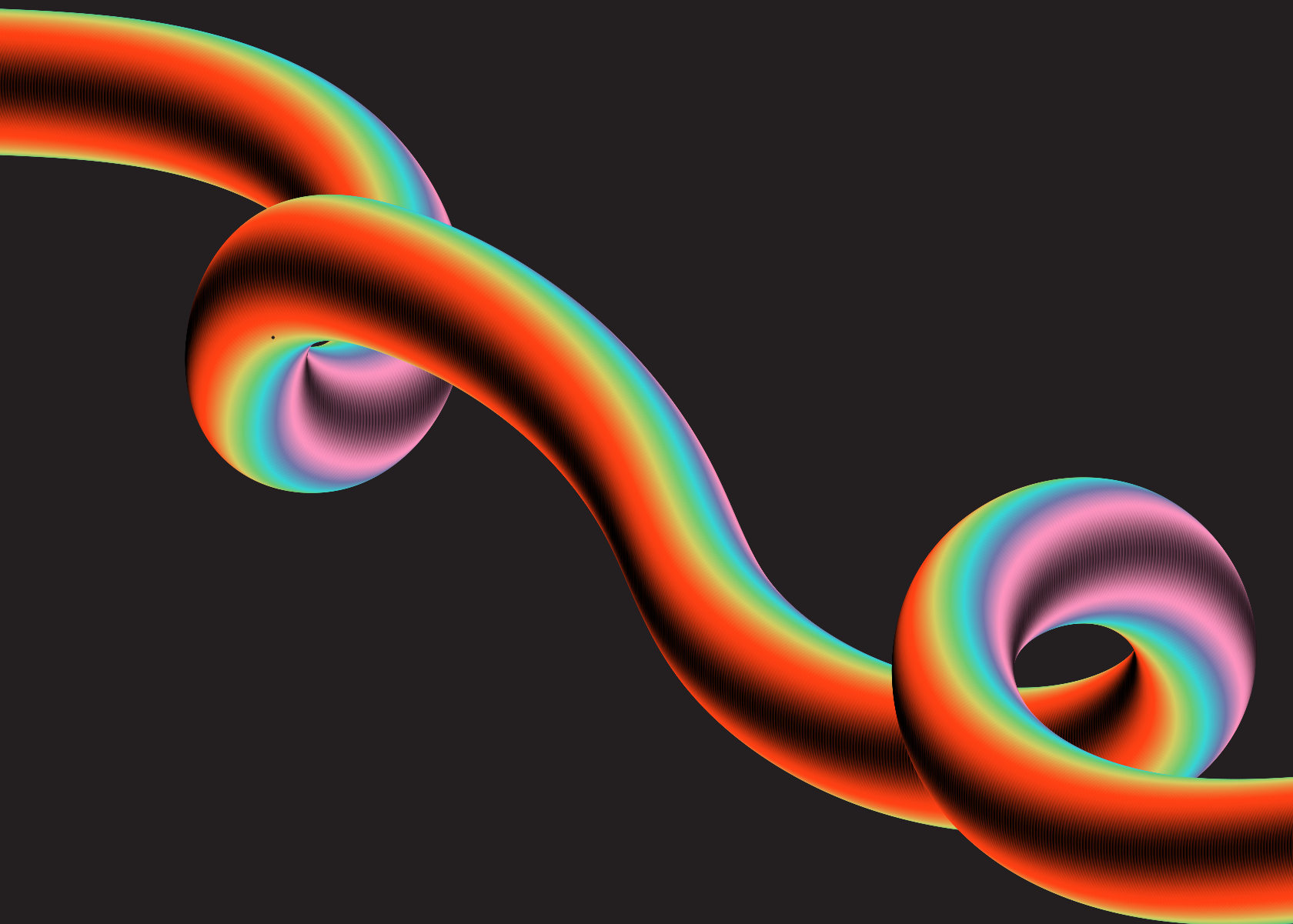
MAE engages with alumni, friends and companies because we know that strong partnerships are imperative and help fuel success. In addition to financial support, you can give back to MAE by mentoring a student, volunteering for one of our advisory boards, recruiting students to your company or partnering with faculty to support their research. By partnering with MAE, you will gain access to top students and faculty at one of the premier MAE departments in the country.

**There are many ways to give back to the MAE Department that help our students and faculty:**

1. By making a gift to the MAE Enhancement Fund, you are helping to fund some of the greatest needs within the department that directly support student programs and faculty research.
2. Establish an endowed scholarship, graduate fellowship or professorship that will generate support in perpetuity for our students and faculty.
3. Give a gift to name a space in Engineering Building III to help support critical research and learning experiences for our faculty and students.
4. Your company can give back by becoming a member of the MAE Corporate Partners program through sponsorship of a senior design project or by making a corporate contribution to the department.









**NC STATE**

**Engineering**



NC State University  
Department of Mechanical and Aerospace  
Engineering  
Campus box 7910  
Raleigh, NC 27695-7910

 @ncstatemae  @ncstatemae

 facebook.com/ncstatemae  nc state mechanical & aerospace engineering