

ANNUAL REPORT **2020-21**

FIU

**Engineering
& Computing**

**Mechanical and Materials
Engineering**

Chair's Message 2020-2021



Dear Friends of FIU Mechanical and Materials Engineering,

I take this opportunity to share the 2020-21 Annual Report of the MME Department. First, I thank every MME student, staff, and faculty member for their support, resilience, and grit demonstrated during COVID-19. As a result of our team's collective effort, teaching and research continued uninterrupted while transitioning back to in-person activities. I am grateful and want to congratulate all for their selfless contribution and support towards the common goal and mission of helping our students.

Despite these challenges, all success parameters were reached; the department successfully hired five new faculty members and witnessed significant growth in research during this last academic year. Our research award grew to \$11 million, a 122% growth since the previous year. Our faculty won major grants and honors. The number of patents awarded doubled during 2020-21. Our graduation rate has grown three times in the last four years.

MME Department hosted its 1st Undergraduate Research Symposium, in which 3 female undergraduate students won the TOP 3 positions and were awarded for their research. Our students and alumni continue to win honors at professional society meetings and conferences at the National level. The support received from our Alumni, Industry Partners, and the National Industrial Advisory Board members in terms of Senior Design Projects is much appreciated.

MME is very proud of its diversity among students and faculty. Female members of the department represent 20% of our faculty. The presence of accomplished women faculty members is an inspiration for female students pursuing degrees in a pervasively male-dominated engineering field.

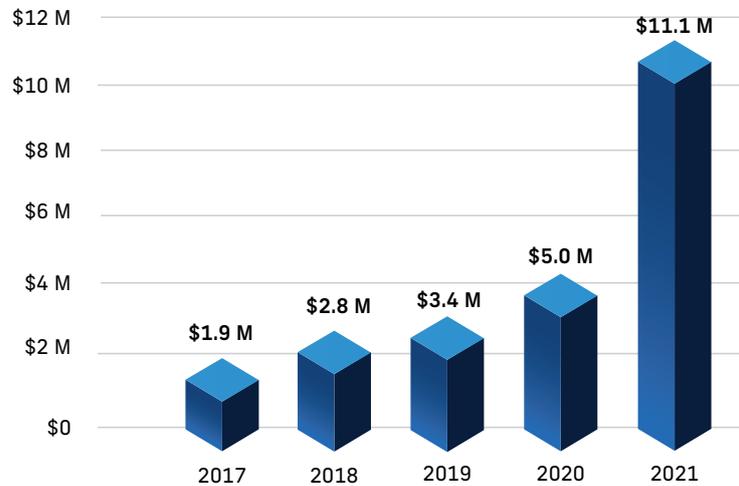
The Next Horizon campaign will put FIU at the forefront of discovery and innovation; health and society; environment and resilience; influence and enterprise; and community, arts, and culture. This will be achieved by focusing on two pillars – student success and research excellence – and attracting investments that will increase scholarships and student support; optimize 21st-century teaching; accelerate research and discoveries; escalate discovery to the enterprise. The Department of Mechanical and Materials Engineering encourages support from all its friends to help the Next Horizon Campaign and invites them to join on the exciting growth journey.

Facts and Figures

MME Faculty

- Full Professors - 8
- Associate Professors - 6
- Assistant Professors - 4
- Assistant Professors (Secondary Appointment) – 3
- Visiting Faculty - 1
- Teaching Professors - 2
- Associate Teaching Professors - 1
- Assistant Teaching Professors - 4
- 20% Female
- 8 Fellows in Professional Societies:
 - 1 ASM
 - 3 ASME
 - 1 AAM
 - 1 RAeS
 - 1 AIAA
 - 1 ACerS
- 2 NSF CAREER Awardees
- 1 National Academy of Inventors

MME Research Awards

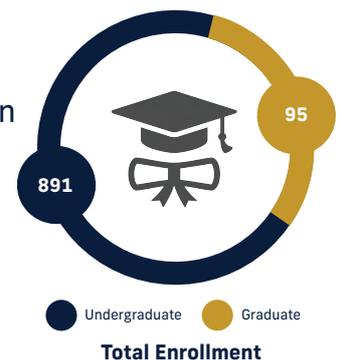


Disclosures and Patents

Disclosures: 18
 Patents filed: 11
 Patents Awarded: 11

MME Students Diversity

16% Female
 65% Hispanic
 8% Black/African American
 891 Undergraduate
 95 Graduate



Faculty

wards

Dr. Daniela Radu (Top Scholar and Grant)

Dr. Daniela Radu has been awarded the FIU Top Scholar award. This award is given to individuals who have significant achievements in their academic research during the Faculty Convocation and Awards Ceremony. Dr. Radu has been recognized for her research and creativity regarding activities for the category of Established Faculty with Significant Grants (Sciences). Dr. Radu has many leadership positions including leader for the Center for Research and Education in 2D Optoelectronics (CRE2DO) and leader of the department's diversity and inclusion committee. CRE2DO research promotes the advancement of space exploration. Dr. Radu and her team research novel two-dimensional materials. These materials are extremely strong nanomaterials with high flexibility and conductivity that are ideal for space when combined with their light weight. Along with her research and leadership positions, Dr. Radu mentors both graduate and undergraduate students and participates as a STEM panelist at various events for "Society of Women in Engineering"



Dr. Agarwal a senior member of NAI and ACERS Fellow



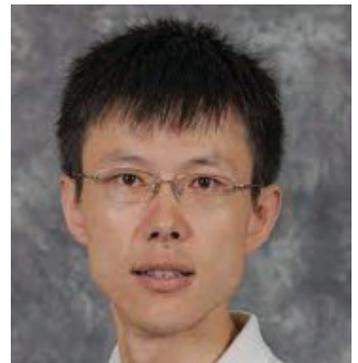
Dr. Arvind Agarwal, professor and chair of the Department of Mechanical and Materials Engineering, is elected to the National Academy of Inventors (NAI) August 2020 class of Senior Members. NAI Senior Members are active faculty, scientists and administrators from NAI Member Institutions who have demonstrated remarkable innovation and produced technologies that have the potential for a significant impact on the welfare of society. These rising stars also have proven success in patents, licensing and commercialization. The American Ceramic Society is the leading professional membership organization for ceramic and materials scientists, engineers, researchers, manufacturers, plant personnel, educators, and students. The Society serves more than 10,000 members from more than 70 countries. Fellows are elected due to their outstanding contributions and productive scholarship in ceramic science and technology.

Air Force Summer Faculty Fellowship Program (AFSFFP)



Prof. Cheng-Xian (Charlie) is the recipient of the 2021 Air Force Summer Faculty Fellowship. During the summer, Prof. Lin and his US student Saja Al-Rifai worked with their collaborators in Air Force Institute of Technology at Wright Patterson Air Force Base to conduct basic research in the area of combustion modeling. The main objective of the summer research is to develop an effective technique for the prediction of combustion instability and flameout within wide operating conditions using computational fluid dynamics method.

Dr. Zhe Cheng has won the Summer Faculty Fellowship Program (SFFP) from the Air Force Research Lab (AFRL). Dr. Cheng conducted his research at AFRL in Dayton, Ohio for 12 weeks and conducting research related to a kind of ceramic materials named high entropy nitrides. By utilizing the state-of-the-art facilities at AFRL, Dr. Cheng aims to synthesize new high entropy nitride materials using different approaches and explore their thermal, chemical, and mechanical properties for potential applications in aerospace and other fields. The research might pave the way for future collaborations between FIU and federal agencies including the Air Force.



Top 2% World's Scientist List

Six of the Mechanical and Materials Engineering faculty members made the [top 2% of Scopus list of top scientists](#). The analysis uses citations from Scopus with data freeze as of May 6, 2020, assessing scientists for career-long citation impact. Our engineers are paving the future of science, as well as leaving a lasting impact for generations to come. The MME professors who reached the 2% are:

- Professor Yiding Cao - Mechanical Engineering & Transports
- Professor George Dulikravich - Mechanical Engineering & Transport
- Professor Emeritus Surendra Saxena - Materials
- Professor Ibrahim Tansel - Industrial Engineering & Automation
- Professor Chunlei Wang - Applied Physics
- Professor Arvind Agarwal - Materials

New Faculty



Dr. Alicia Boymelgreen

Dr Alicia Boymelgreen was born and raised in Melbourne, Australia. She completed her B.Eng (Hons) at Monash University in Melbourne after which she travelled to Israel to complete her M.Sc (summa cum laude) in Mechanical Engineering at Tel Aviv University and PhD in the Mechanical Engineering department at the Technion – Israel Institute of Technology. Dr Boymelgreen’s M.Sc. thesis, conducted under the guidance of Prof. Emeritus Touvia Miloh focused on developing theoretical models for the electrokinetic transport of complex colloids. At the Technion’s MicroNano Fluidic Laboratory, headed by Assoc. Professor Gilad Yossifon, Dr Boymelgreen explored these models experimentally, finding new approaches for directed control of soft matter and dynamic assembly of reconfigurable materials with applications to smart material design, bottom-up

micro/nano fabrication and lab-on-a-chip diagnostics. Dr Boymelgreen’s favourite subjects to teach are Heat Transfer and Fluid Dynamics. Currently, Dr Boymelgreen’s research interests include the design of colloid based, reconfigurable multi-functional materials, the intersection of micro/nano fabrication with additive manufacturing, and the application of micro/nanofluidic systems to new fields of research such as environmental studies.

Dr. Aaron Tallman

Dr. Aaron Tallman’s expertise is in developing data-driven methods that leverage mesoscale computational modeling of metals. Dr. Tallman has authored several peer-reviewed articles, in which he developed data-driven methods to address problems in engineering design, uncertainty quantification, and characterization. In his postdoctoral work, Dr. Tallman has developed LaRomance, a suite of data-driven constitutive models of the primary and secondary creep of structural steels intended for use in high-temperature applications. Dr. Tallman has also developed data-driven methods for predicting dislocation content from diffraction peak broadening, methods that notably bypass physical idealizations used in traditional diffraction line profile analysis models of dislocation broadening. Dr. Tallman graduated in 2018 from Georgia Institute of Technology with a Ph.D. in Materials Science Engineering.



Dr. Abderrachid Hamrani

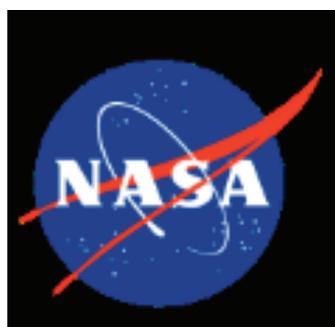
Dr. Abderrachid Hamrani joined FIU in Fall 2021 semester as Visiting Faculty. Dr. Hamrani was a postdoc researcher at McGill university (Canada, 2018-2020). Before that, he was an assistant professor and senior lecturer at University of Boumerdes (Algeria, 2011-2018). He received his Ph.D. in Mechanical engineering (manufacturing processes) from Arts et Métiers Institute of Technology Paris Tech (France, in 2016). His current research interests include AI and machine learning, advanced modeling and simulation in computational mechanics (solids and fluids), optimization techniques and inverse analysis. He has published over 22 scientific articles, which includes 12 peer-reviewed journal articles, 1 chapter-book.

CELL-MET ERC



The NSF Engineering Research Center in Cellular Metamaterials – CELL-MET – is designed to stimulate translation of research to practice by facilitating worldwide corporate, clinical, and institutional partnerships. CELL-MET—with Boston University as the lead institution— aims to transform cardiovascular care by combining breakthroughs in nanotechnology and manufacturing with tissue engineering and regenerative medicine, while also developing areas of expertise in education, diversity, administration, and outreach.
CELL-MET @FIU PI: Dr. Arvind Agarwal

NASA-CRE2DO



CRE2DO' s primary goal is to develop cutting-edge technologies that integrate 2D materials in space-resilient infrastructure materials, communication devices, and small satellite technology. The nanomaterials enhance reliability of mechanical and electrical components in spaceship devices and wearable electronics. The superconductor materials developed by CRE2DO aim to eliminate the need for battery power, while the material composites could be used in the infrastructure for spaceship components destined for Mars, and on wearable electronics placed inside space suits to enable highspeed communication by astronauts back to the space station.
NASA-MIRO PI: Dr. Daniela Radu

PRE-CCAP FIU



Pre-CCAP has offered summer research opportunities at Plasma Forming Laboratory (PFL), in the Department of Mechanical and Materials Engineering. The Research Experiences for Undergraduates (REU) hired undergraduate students enrolled in a STEM academic program (Mechanical and Materials Engineering or related fields) to perform different research' s activities in their 9 weeks stay at FIU. PRE-CCAP REU's focused their research on material characterization, advanced materials processing, ceramics and spark plasma sintering.
PRE-CCAP @FIU PI: Dr. Arvind Agarwal

CeSMEC



CeSMEC is an interdisciplinary facility that combines physics, chemistry, geosciences, and materials engineering. Center is engaged in fundamental research related to the materials, environment, focusing on using Engineering methods for alternative energy, Carbon capture, and high-pressure science. Actively engaging students in research and the pursuit of excellence has always been a guiding principle for CeSMEC.
CeSMEC Director: Dr. Jiu Hua Chen

Real time examination of impact of micro/nanoplastics on early stage development of marine species

Dr. Alicia Boymelgreen

Dr Boymelgreen's lab in collaboration with Dr Terry Bradley at University of Rhode Island and Dr Arif Sarwat in the ECE department of FIU is combining microfluidic technology and AI to examine the impact of micro and nano plastic pollution on the early stage development (embryonic and larval) of marine species. These stages are the most susceptible and any observed negative outcomes could have far reaching consequences for the sustainable future. The knowledge obtained from this project can be used to categorize risks associated with varying nanoplastics towards reducing toxic waste and developing sustainable practices and nutritional guidelines for human consumption of marine species.

Advanced Functional Material Lab

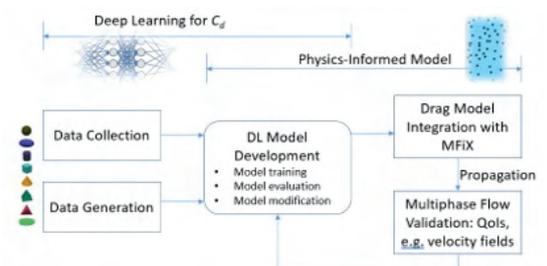
Dr. Cheng-Yu Lai

Dr. Cheng-Yu Lai's research group focuses on advanced functional materials with applications in the environmental and biomedical fields. One of the recent projects aims to engineer lignin, a naturally occurring polymer, into a pH-responsive material, by embedding chemical bonds that break upon exposure to a pre-determined pH range. The lignin-based pH-responsive material could be used in coating applications that require both biocompatibility and fast degradation upon exposure to the pH stimulus. The material will be amenable to seed coating applications, contributing to lignin valorization. Replacement of plastic-based polymeric seed coatings with a biodegradable material will mitigate potential environmental threats posed by microplastics.

Development and Evaluation of a General Drag Model for Gas-Solid Flows via Physics-Informed Deep Machine Learning

Dr. Charlie Lin

Dr. Charlie Lin's group is currently conducting research on applying deep/machine learning techniques in multiphase flow modeling and simulation. Accurate prediction of air-particle multiphase flow is very important for developing more efficient and cleaner fossil energy technologies. The overall objective of this project is to develop, test, and validate a general drag model for multiphase flows in assemblies of non-spherical particles by a physics-informed deep machine learning (PIDML) approach using artificial neural network (ANN). The project is funded by the U.S. Department of Energy for three years.



Nanomaterials Laboratory

Dr. Daniela Radu

Dr. Daniela Radu's research in the Nanomaterials Laboratory is centered on nanostructured materials for optoelectronic applications. The group explores Ge-based nanoalloys and two-dimensional 2D nanostructures in the family of transition metal chalcogenides (TMCs) for their quantum properties and lasing applications. Radu's group utilizes alloying at the nanoscale, preparing Ge-based nanoparticles (NPs) through a solution-phase process, followed by use of additive manufacturing techniques to fabricate silicon-compatible lasers. Funded by NASA, the Office of Naval Research, and the National Science Foundation, our research projects aim to create the next generation of 2D TMCs quantum materials, and nanolasers integrated in quantum photonics.

Student news and success

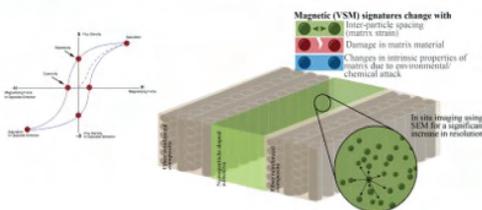
1st MME Undergraduate Research Symposium

The Mechanical and Materials Engineering Department hosted its first Undergraduate Research Symposium, organized by Dr. Vladimir Pozdin. Students presented various research papers showing the undergoing research activity in the department.

The top three presentations got awarded money for their challenging work and excellent ideas. Three undergraduate female researchers reached the top place with their presentations: Juliette Dubon, Kazue Orikasa, and Nicole Bacca.

First Place: Juliette Dubon

Bond Quality Evaluation using Adhesives Doped with Magneto-electric Nanoparticles



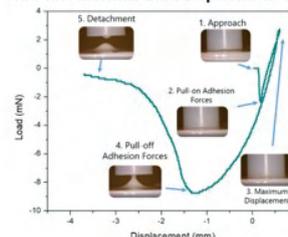
Juliette Dubon graduated in mechanical engineering in Spring 2021. She worked for three years in the composites laboratory as a research assistant for Dr. Boesl and Dr. McDaniel on various composite projects funded by the ONR and FAA. Currently, she works for Boeing Defense and Space Organization to develop new composite materials for the Boeing Next Generation Composites Team.

Kazue Orikasa is a senior undergraduate research assistant at Plasma Forming Laboratory at the Mechanical and Materials Engineering Department at Florida International University. Kazue is mainly interested in the materials science and engineering field. Her journey as a researcher started early during her junior year. Ever since then, she has worked on various projects including developing an indentation-based mechanical characterization platform for biomaterials and other ultra-soft materials and developing 2D material composites with exceptional mechanical and thermal properties. Inspired by this research experience, Kazue aspires to pursue a master's degree in the materials engineering field.

Second Place: Kazue Orikasa

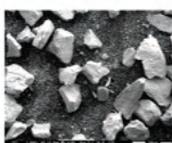
Meso/Macro-Scale Ultra-Soft Materials Mechanical Property Evaluation Device and Testbed

Ultra-Soft Materials Load-Displacement Curve



Third Place: Nicole Bacca

Surface Erosion of Lightweight Aluminum and Titanium Alloys by High-velocity Regolith Impacts to Simulate Windstorms on Martian Surfaces



MGS-1



Al6061-T6 - Blasted at 0 degrees

Nicole Bacca is currently a research assistant at Plasma Forming Laboratory (PFL) and graduated from bachelor's in Mechanical Engineering in Spring 21. She has worked at PFL for 3 years researching over different materials and applications, such as aerospace, biomedical, novel testing methods. In the past, she interned at Intel and NASA, and in Fall she will begin her graduate studies as a PhD student at Boston University.

Outstanding Bachelor's Degree Award in Mechanical Engineering



Fall 20: Briana Canet

Ms. Briana Canet graduated with a 3.83 GPA

Briana started as a Research Assistant with Dr. Arvind Agarwal under the National Science Foundation Cellular Metamaterials program. During her time, she conducted tissue engineering and 3D printing research, represented FIU. She also participated in the 2020 U.S. Department of Energy Solar District Cup competition. Briana is currently in the process of publishing a peer-reviewed article. She gives back to her community by mentoring local 9th graders in research and hands-on learning.

Spring 21: Valerie Bracho Perez

Ms. Valerie Bracho Perez graduated in Mechanical Engineering with an impressive 3.92 GPA

Throughout most of her undergraduate studies, Valerie Vanessa Bracho Perez was involved in engineering education research. She has published a paper in the American Society for Engineering Education (ASEE) Annual Conference of 2020, and will be publishing another in the Annual Conference of 2021. Her research interest includes integrating LAs into engineering courses, examining responsive teaching practices in engineering courses, and faculty development. Valerie Bracho Perez is currently a Master of Science in Mechanical Engineering student.



Lia Paolino wins the 2nd Place in 2021 Life Sciences of South Florida (LSSF) Symposium

Her talk was titled "Nanomechanical properties of electrically stimulated cardiomyocytes". Lia is a junior in Biomedical Engineering and is planning on continuing her research with Prof. Arvind Agarwal in Mechanical and Materials Engineering department on NSF ERC Cell Met.

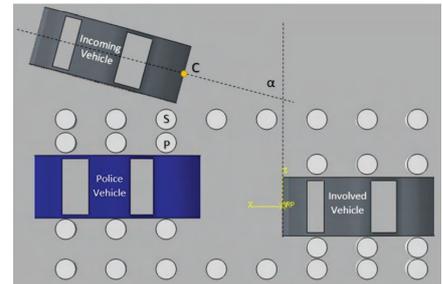
Senior Design Showcase

The Senior Design Capstone project is broken into two courses: EML 4551, Ethics Study and Design Organization, and EML 4905, Senior Design. In the first course on Design Organization, students are organized into design teams by selecting their preferences from a selection of industry sponsored projects, faculty led projects and student ideas and complete the preliminary design. In Senior Design, details pertaining to their final design project are completed with either a prototype (full-scale, miniature, functional or possibly a mock-up), or a set of engineering drawings only if a large system is designed, for example an HVAC system. The capstone design project emphasizes teamwork as an integral part of the design process. All the projects are presented in a department wide conference at the end of the semester and evaluated by the Industrial Advisory Board and faculty. The spirit of the Capstone Design Project is provided by ABET (the Accreditation Board of Engineering and Technology), which accredits all national engineering programs. With the health and well-being of our guests and community in mind, the College of Engineering & Computing (CEC) has held a Virtual Senior Design Showcase in the Fall of 2020 and the Spring of 2021 for our students to showcase their work. The outstanding projects for each semester are highlighted below:

Fall 2020: Trooper Placement to Minimize Injury in Roadside Crashes:

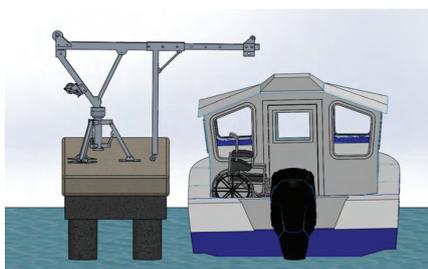
Valerie Bracho Perez, Roberto Navarro, Alexander De Socio

This project has as a main objective to find the safest zones for police officers to stand in during traffic stops on the roadside in order to decrease their probabilities of severe and/or lethal injuries. Specialized computer software is utilized to replicate a plethora of common scenarios and find the most dangerous zones in these simulations. The data obtained allowed for the creation of a user interface that officers could use in their traffic stops duties.



Spring 2021: Wheelchair Accessible Lift System for Boat Transfers:

Hamad Alshalawi, Juliette Dubon, Sebastian Garcia, Matthew Suarez, Eric Torres



Project Description: In Miami and all over the world, being out on the water is one of the most enjoyable extracurricular activities. Accessibility boarding on and off of a boat may come easy to some individuals, however to passengers in wheelchairs who have limited mobility it may not be as easy. Our team understands how essential it is for there to be an accessible, safe, modular, and cost-effective accommodation for aiding passengers with limited mobility on and off the boats. For this reason, our team has developed the Wheelchair Accessible Lift system. The principal objective of the Wheelchair Accessible Lift System project is to design a lifting system for passengers of reduced mobility to transport on and off vessels.

MME Student Highlights

US Patents Awarded



Dr. Amin Rabiei Baboukani

Dr. Amin Rabiei Baboukani was awarded 2 patents in 2020-2021. Dr. Rabiei received his Ph.D. in Materials Engineering in Spring 21. Amin Rabiei Baboukani joined Prof. Chunlei Wang's group in 2017 as a Ph.D. student in the Department of Mechanical and Materials Engineering at Florida International University (FIU). His research interest was mainly focused on the investigation of novel 2D materials specially phosphorus-based electrodes for high-performance energy storage devices, including LIBs and supercapacitors. He graduated in Spring 2021 and currently he is a post-doctoral associate in the LION Battery Technology a research group at FIU to develop novel electrode materials for high-performance rechargeable batteries.



Dr. Pranjal Nautiyal

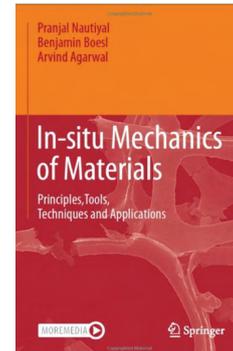
Dr. Pranjal Nautiyal was awarded 4 patents in 2020-21 as outcome of his Ph.D. dissertation in Materials Engineering, Dr. Nautiyal worked in the Plasma Forming Lab under Prof. Arvind Agarwal's supervision. Pranjal's research and patents are focused on developing advanced materials and composites reinforced with Boron Nitride Nanotubes (BNNT) and Graphene Foam. His research was also focused on developing insitu mechanical characterization methods on cold sprayed deposits. Currently, Pranjal is working as a hired as Postdoctoral Researcher at the University of Pennsylvania.

MME Student Highlights



Chiamaka Okafor, 2nd place at Three minute thesis (3MT)

Doctoral students spend a minimum of three years brainstorming, prewriting, researching, and sometimes must start all over from scratch. Now imagine having to explain your life's work to an audience that doesn't know anything about your work. That is exactly what runner-up Chiamaka Okafor did in the "Three Minute Thesis" (3MT) competition hosted by Florida International University. The 3MT competition consisted of competitors explaining their research to an audience not in their field in under three minutes and make sure their audience understands the purpose of the research. Okafor is an MME graduate student specializing in investigating material interactions in specific environments with a focus on the use of electrochemical impedance spectroscopy for a better understanding of biological responses of biomedical implants.



New book releases

"In-situ Mechanics of Materials: Principles, Tools, Techniques and Applications" is the first comprehensive book to address in-situ mechanics approach, which relies on real-time imaging during mechanical measurements of materials. The book presents tools, techniques and methods to interrogate the deformation characteristics of a wide array of material classes, and how the mechanics and the material microstructures are correlated. Pranjal Nautiyal earned his PhD in 2020 and is currently a Postdoctoral Researcher at the department of Mechanical Engineering and Applied Mechanics at the University of Pennsylvania.

SAE Aero Design Competition

The SAE Aero Design Competition is a competition with teams from across the US and around the world, held in Lakeland, FL. The FIU Aero team was awarded 2nd place in the mission performance and 2nd overall, the highest achievement for an FIU team ever. The FIU AIAA Student Chapter team composed of Mechanical Engineering undergraduate students spent the last year researching, designing, optimizing, and building their competition aircraft using sophisticated software. Students Ruben Fernandez, Hernando Lugo, Kishan Kalpoe, Walid Esiely, Clara Bahoya, Geisy Valdes, and William San Pedro were advised by Prof. George S. Dulikravich on every step of this project. While interviewing one of the winning students, Ruben Fernandez, he gave some insight in the process he and the team went through to get to where they were. "Coming 2nd in the competition was a great feeling. While we designed the plane to compete for a top 3 spot at the competition and tested the plane before to make sure our calculations were correct, we did not know where we would place at competition." said Fernandez. "Right before the competition we had an accident with the plane that required us to fix the plane over night and we obviously had no idea how other teams would perform with their aircrafts. Coming in second was a great feeling after all the work the team put in over".



MME Alumni Highlights

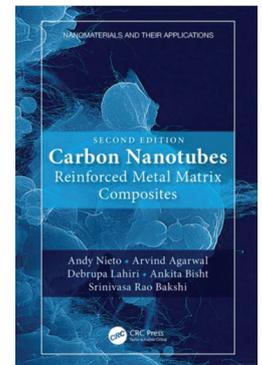
MME Alumni starts Space tech Company



Dr. Pradeep Shinde established SpaceLoon (Space Balloon Technologies Corp.), in Miami, just after he received his Ph.D. degree in Mechanical Engineering in 2016. Dr. Shinde has been working on several NASA-Florida Space Grant Consortium-funded CubeSat-based high-altitude ballooning (~30km altitude) missions with FIU for more than six years. SpaceLoon will work on the development of a Mesospheric ballooning that is capable of transporting small payloads up to 200kg into the sub-orbital region up to 80km. Existing technologies allow sub-orbital access either by high-altitude ballooning up to around 35km or via rocketry. SpaceLoon's technology will fulfill the needs of the NASA, NOAA, academia, and scientific community to better understand the mesosphere and its effects on the Earth which otherwise is not feasible using existing rocketry or high-altitude ballooning. SpaceLoon's technology will also fulfill the low-cost and wide coverage needs of the telecommunication service providers; remote sensing, and space tourism needs of the private sector; military needs for communication and persistent surveillance; using infrared, electro-optical, and hyperspectral imagery sensors. NSF -I Corp grant will enable a greater understanding of problems faced by potential customers.

New book releases

The 2nd edition of the *"Carbon Nanotube Reinforced Metal Matrix Composites"* was released on May 18, 2021. A section on in-situ mechanical testing was added to discuss techniques for real-time observation of deformation mechanisms on CNT-MMCs and the new discoveries made as a result. Dr. Andy Nieto earned his Master degree in Materials Engineering in 2013, and is currently an Assistant Professor at the Department of Mechanical and Aerospace Engineering, Naval Postgraduate School (NPS), Monterey, CA



Student emergency relief fund



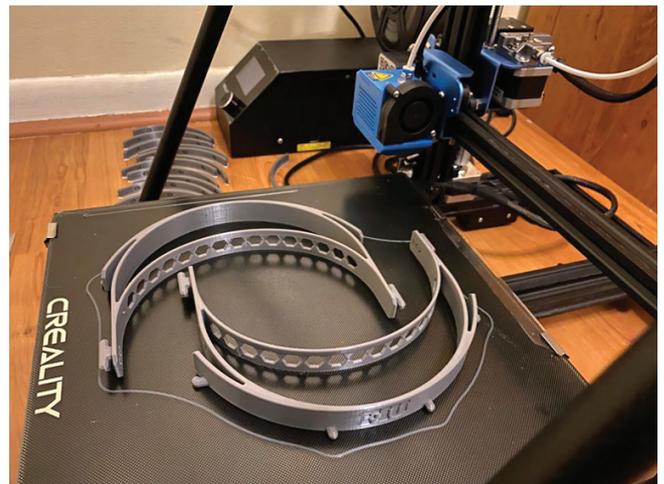
Alumnus Josue Raudales is both a proud panther and a proud panther parent. Raudales was an international student from Honduras and has both his bachelor's and master's degree in mechanical engineering. When the COVID-19 pandemic began in early 2020, Raudales quickly came to the realization that many of his daughter's peers were struggling. Raudales made a gift to FIUstrong to support students in financial need through emergency relief through the Panther Protection Parent & Family Fund. When asked about the decision, Raudales did not hesitate to look back into his experiences and struggles. He claims that he thought FIU was out of reach for him due to cost, he faced many challenges from the start but that did not stop him from reaching his goals. He noted that he had to work over 30 hours a week, commute using public transportation, and carry a full academic load as well.

Yet, it was all possible thanks to the support from FIU Honors College. That is why he decided to gift the stimulus check he received to help the current panthers and leaders of tomorrow during this challenging time, the same way he had received help many years ago.

Covid time mask production

During the beginning of 2020, the United States was hit with a major and unprecedented pandemic. This led the nation into a state of emergency. Hospitals were overcrowded and there was a shortage of medical equipment – particularly protective masks. Florida International University took notice, and a cross-department task force came together to design, produce, and distribute face shields for health care workers at Baptist Hospital. At the center of the initiative was FIU's College of Communication, Architecture, + The Arts (CARTA). CARTA mobilized its 3D printing facilities, faculty, staff and students to produce a minimum of 1,000 face shields. CARTA had their architecture students work remotely to design the first line of defense for health care workers made from non-toxic PLA (polylactic acid). However, CARTA couldn't do it alone, and sought out help from the College of Engineering & Computing to help print the face shields.

In 2020, Mr. Richard Zicarelli was one of a small group of individuals that was instrumental in FIU's efforts to develop and produce a cost-effective ventilator for COVID-19 patients, working 28 consecutive 12–16-hour days to meet the demanding task, FIU was able to deliver results as quickly as possible and produced a successful working prototype. In addition, Dr. Zicarelli was also tasked with managing COE's personnel and 3D printing efforts along with John Stuart from Miami Beach Urban Studies (MBUS) to produce thousands of face shield PPE for front line health care workers and first responders battling the COVID-19 virus. To date, the combined efforts of the COE and MBUS, have produced over 6000 face shield units. Zicarelli received the FIU Service Excellence (Team) Award, as part of FIU's 3D Face Shield Mask Team.



Another professor who played a huge role in the mask production was Dr. Tony Thomas. Dr. Thomas recalls the experience as unique and terrifying. He remembers driving down 8th street from Kendall to pick up the 3D-printer from the PFL lab at FIU at the Engineering Campus and how deserted it was, something that is rarely seen in Miami. Dr. Thomas has situated the printer in his living room which kept continuously printing masks. The printer did break down occasionally, as it is not meant for that kind of continuous work. Thanks to some DIY videos on YouTube, Dr. Thomas was able to repair the printer and keep it working himself. "I was teaching from my living room during then and students kept asking what is that science fictional noise in the background," said Dr. Thomas, referring to his experience on remote learning. "I got used 3D printer's noise to an extent that after I stopped printing, I could not fall asleep without that noise. But it was worth the effort." Once in every 3-4 days, everyone in the effort would come to EC to drop off the masks they had printed as well as retrieve more plastics to continue printing at home. All regular working hours were thrown out, all research was halted, the community needed help, and FIU departments came together to provide the much-needed assistance. All the students and faculty came together for this selfless cause risking the infection to protect the first responders who protected the community. Faculty, staff, and students alike made this idea a priority. The idea quickly became a prototype, and then became a fully functioning product to help the community in a time of need. None of this would have been possible without the combined efforts of many dedicated faculty, staff, students and volunteers that worked tirelessly to produce and distribute these shields to those that needed it most.

When the pandemic first hit, Dr. Meer Safa was tasked with converting a hands-on laboratory experience for students into a fully online one. When a program is designed a certain way, there is little room for remodeling, especially converting one extreme (hands-on) to another (fully online.) Students had no access to the instruments needed to perform their task, therefore Dr. Safa had to get creative.

Dr. Safa came to campus and recorded himself doing the experiments and explaining the material. He later edited and uploaded his own videos to canvas for students to watch and make final calculations. Students were expected to read the lab manual, analyze the data, and finally write the lab report. Dr. Safa was able to record the rest of the semester's worth of labs within the week. Along with the recorded labs, he also provided students with other resources to help facilitate the learning process such as three separate videos (discussing theory, experiment, and calculations) and external resources.

Dr. Safa notes that he was surprised at how effective the online labs were. Students were grasping the concepts, actively participating, turning in assignments, and making it to the final quiz. Dr. Safa also made sure to hold open communication with his students, making himself easily accessible through zoom or emails for any questions or concerns student may have had.



Online Laboratory courses during Covid

Retirement of Prof. Cesar Levy



In 2020, in the midst of the pandemic, Professor Cesar Levy retired.

Dr. Levy is distinguished in mechanical engineering (Ph.D.), applied mathematics (M.S), and aerospace engineering (B.S). His education spans all corners of the United States. He obtained his Bachelor of Science degree in Aerospace Engineering in 1972 from Polytechnic Institute of Brooklyn, New York. Soon after, he completed his Master's degree in Applied Mathematics from the Courant Institute of Mathematical Sciences at New York University, New York in 1974. Finally, Dr. Levy obtained his Ph.D. in Mechanical Engineering at Stanford University, California. Besides his decorative education, he was also part of the U.S military, earning a CPT in active service and an LTC in army reserves (1978-1999).

In his 36 years of teaching at FIU, Dr. Levy has had an influence on those around him from many different job positions. From professor to the co-graduate program director, he has taught hundreds of students and even facilitated the process for many more to join the panther family as graduate students. In this time, he has also published over one hundred articles under his name in different areas of the mechanical engineering field. His research has served as a reference point for many studies that came after.

Dr. Levy has also been part of the ALLSTAR project. The ALLSTAR project was founded to ensure learning materials in the field of aeronautics and aviation. This is essentially a bunch of modules that contain mini-classes ranging for children to young adults from ages ten to eighteen put together for someone to teach these fundamentals for aeronautics and aviation. It is important to note that not many students are even taught about this growing up. Schools focus more on core classes and rarely offer electives such as astronomy, aeronautics, or spacecrafts. This program was accessible free of charge to anyone who wanted to learn a thing or two about aeronautics and aviation. While some programs offer summer camps with these classes and activities to facilitate learning (Space Camp, for example), not everyone has access to the financial means to afford them. The ALLSTAR project is a free source that can be used by anyone! Dr. Levy strived that everyone had easy access to one of his favorite things. After all, he did dedicate four years of his life to learning about this topic in higher education. Dr. Levy shared his knowledge with the youth of the country - free of charge.

Under his care, the Department of Mechanical and Materials Engineering (MME) has awarded fourteen Doctoral Evidence Acquisition fellows (DEAs) and twenty-three Dissertation Year Fellows (DYFs). Under his administration, the college was also successfully re-accredited as a research institution.

MME Program Expertise and Laboratories

Areas of Expertise

- Robotics and Mechatronics
- Thermo/fluid Systems
- Multidisciplinary Design Optimization
- Renewable Energy
- Advanced Manufacturing
- Advanced Materials and Processing
- Nanomaterials and Biomaterials
- Energy Materials
- Ceramics and Composite Materials
- Functional Materials

Degree Programs

- BS in Mechanical Engineering
- Accelerated Bachelor's/Master's Degree in Mechanical Engineering
- MS & PhD in Mechanical Engineering
- MS & PhD in Materials Science and Engineering

MME Laboratories and Centers

- Advanced Ceramics Laboratory
- Advanced Materials Engineering Research Institute (AMERI)
- Center for Study of Matter at Extreme Conditions (CeSMEC)
- C-MEMS Laboratory
- Cold Spray and Rapid Deposition (CoIRAD)
- Composites Laboratory
- Computational Fluids and Energy Sciences Laboratory
- Corrosion Laboratory
- Engineering Manufacturing Center (EMC)
- Fluid Structure Interaction Laboratory
- Mechatronics Laboratory
- Multidisciplinary Analysis, Inverse Design, Robust Optimization and Control Laboratory (MAIDROC)
- Nanomaterials Laboratory
- NASA-CRE2DO
- NSF Engineering Research Center in Cellular Metamaterials (CELL-MET)
- Plasma Forming Laboratory (PFL)
- Robotics & Automation Laboratory
- Sustainable Energy and Thermal Transport Systems Laboratory

Faculty Expertise – Professors

Arvind Agarwal, PhD Nanocomposites and Coatings, Plasma and Cold Spray, Ultra-High Temperature Ceramics, Spark Plasma Sintering, Nanomechanics and Nanotribology

Yiding Cao, PhD Heat Transfer, Heat Pipes Gas Turbine Cooling, Internal Combustion Engines, New Air Conditioners, Concentrating Solar Power, Solar Receivers

Jiuhua Chen, PhD Crystallography, Mineral Physics, High pressure and temperature materials processing, advanced materials characterization

George Dulikravich, PhD Multi-disciplinary computational analysis, inverse problems and design optimization, Biomedical engineering, Alloys design, Electro-magneto-fluid dynamics

Norman Munroe, PhD Biocompatibility of biomaterials Corrosion of Nitinol and bioresorbable alloys, Fuel Cells, Renewable Energy systems, Deepwater Oil & Gas, Climate Change, Greenhouse Gas Accounting

Ibrahim Tansel, PhD Structural Health Monitoring (SHM), Additive Manufacturing (AM), System Identification, Automation of Manufacturing, Soft Robotics, Tracing of Magnetic Objects, Non Destructive Evaluation (NDE)

Chunlei Wang, PhD C-MEMS based micro-biofuel cells, C-MEMS based biosensing, Micro super capacitors, materials for energy storage, Nanomaterials

Associate Professors

Benjamin Boesl, PhD Solid mechanics, fracture mechanics, in situ mechanical testing, high strain rate/ dynamic material response, processing- structure-property relationship

Zhe Cheng, PhD Novel materials for solid-state fuel cells, Ultra high temperature ceramics, photovoltaic solar cells, In- situ spectroscopy characterization

Cheng-Yu Lai, PhD Functionalized mesostructured materials (mesoporous and hierarchical silica nanomaterials) engineered for the following applications: Bio-nanotechnology

Charlie Lin, PhD Computational Fluid Dynamics, Heat Transfer, Microfluidics and Energy Simulations, with applications in HVAC, Indoor Environment, Buildings and Data Centers, Power Plants, Electronic Cooling, Solar and Geothermal Energy Utilization

Dwayne McDaniel, PhD Robotics with applications to infrastructure inspection, autonomous systems, sensor systems, nondestructive evaluation, multi-body dynamics and structural mechanics

Daniela Radu, PhD Nanomaterials for solar photovoltaics, Advanced functional materials, Sensor design for heavy metals detection

Assistant Professors

Alicia Boymelgreen, PhD: Micro/Nanofluidics, Lab-on-a-chip, Soft Matter, Active colloids, Micro/nanoscale cargo transport and delivery, Electrochemical sensing, Janus particles, Electrokinetics

Darryl Dickerson, PhD Bioinspired materials, biological interfaces, orthopedic tissue biomechanics, tissue engineering

Pezhman Mardanpour, PhD Constructal law, Design with constructal theories, Physics of design, Evolution, Nature, Aeroelasticity, Origami structures

Assistant Professors Secondary Appointment

Alexandra Coso Strong, PhD: Human-Centered Design Methodologies, Complex Systems Design, Engineering Design Education, Faculty Development, and Graduate Student Experiences.

Stephen D. Secules, PhD: Equity, inclusion, and marginalization in education, Undergraduate engineering educational culture, Learning sciences, sociocultural learning theories, New paradigms for co-curricular support, Ethnography and interaction analysis methodologies, Critical whiteness and masculinity studies

Vladimir A. Pozdin, PhD: Wearable health monitoring, In-situ sensing, Flexible electronics

Teaching Professors

Wei-Yu Bao, PhD Data Acquisition, System Identification, Automatic Control, Modeling and Simulation, Computer Aided Design, Computer Aided Manufacturing

Seyad Beladi, PhD Internal Combustion Engines Combustion, Thermodynamics, Finite Element, Modeling

Kevin Boutsen, PhD Internal Combustion Engines, Vehicle Dynamics, Thermodynamics, Exhaust Flow, Motorsport Engineering

Carmen Muller, PhD Simulation on Mechanical Engineering, vibrations, Finite Element Analysis, Biomechanics, musculoskeletal system, Motion Analysis, Design of Mechanical Medical Devices

Ju Sun, PhD Ultrafast laser-based techniques for materials processing, micro fabricating, measuring, and nonlinear imaging of biomedical and microscale engineering systems

Tony Thomas, PhD Advanced and NonTraditional Manufacturing, Finite Element Analysis, Corrosion, Advanced Materials

Andres Tremante, PhD Computational Fluid Mechanics & HeatTransfer Hydro & Thermal Turbomachines, Energy Conversion & Transportation, Automotive & Aerospace Engineering

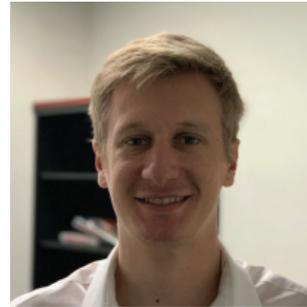
MME Department Key Personnel



Dr. Arvind Agarwal
Distinguished Univ.
Professor and Chair
AMERI Director
(305) 348-1701
agarwala@fiu.edu



Dr. Benjamin Boesl
Associate Chair and
Undergraduate
Program Director
(305) 348-3028
bboesl@fiu.edu



Dr. Kevin Boutsen
Undergraduate
Program Co-Director
305-348-9943
kboutsen@fiu.edu



Dr. Daniela Radu
Graduate Program
Director
(305) 348-4506
dradu@fiu.edu



Dwayne McDaniel
Graduate Program
CoDirector
(305) 348-6554
mcdaniel@fiu.edu



Carmen Schenck
Senior Instructor
and Advisor
(305) 348-4183
schenckc@fiu.edu



Dr. Meer Safa
Undergraduate
Laboratory
Manager and Safety
Manager
(305) 348-1806
msafa@fiu.edu



Richard Zicarelli
Coordinator
Engineering
Manufacturing
Center (EMC)
(305) 348-6557
zicarell@fiu.edu

MME Department Key Personnel



Mabel Fernandez
BMME Program
Coordinator
(305) 348-1541
mabferna@fiu.edu



Mariam Barrueco
BMME Program
Specialist
(305) 348-7292
mbarruec@fiu.edu



Tiziana Leoni
Research
Coordinator
305-348-0198
tleoni@fiu.edu



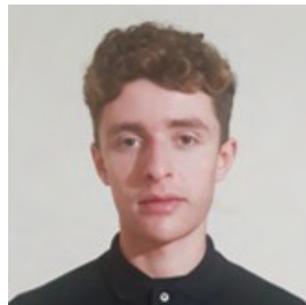
Giselle Alvarez
AMERI office
Manager
(305) 348-2569
gisalvar@fiu.edu



**Beatriz Morillo
Molero**
Administrative
Specialist CELL-MET
and CoIRAD at FIU
305-348-9945
bmorillo@fiu.edu



Eduimar Hinestroza
Program Assistant,
NASA Center for
Research and
Education in 2D
Optoelectronics
(CRE2DO) at FIU
ehinestr@fiu.edu



Nicholas Gonzalez
MME Webmaster
nsgonzal@fiu.edu



Gabriella Hernandez
MME Copywriter
gabrhern@fiu.edu



FIU

**Engineering
& Computing**

**Mechanical and Materials
Engineering**

**10555 West Flagler Street
Miami, FL 33174**

