

Graduate Programs in Mechanical and Aerospace Engineering

THE UCF DIFFERENCE

CHALLENGING, CUTTING-EDGE RESEARCH

The department's students work alongside and publish with distinguished researchers who are internationally renowned for their contributions to science.

With \$8.2 million in grant funding (2017-18), the department's research activities span a variety of topics: advanced turbomachinery, heat transfer, fluids flow, internal combustion optimization, aerodynamics, rotodynamics, structural integrity of micro systems, nano-manufacturing, sensors and actuators, alternative fuels, biomedical engineering, high-temperature materials and coatings and thermal management of optical/electronic devices, sustainable and advanced energy research, and more.

WORLD-CLASS FACULTY

Our faculty are world-class scholars who perform fundamental and applied research at the forefront of scientific discoveries. Annually they publish approximately 110 journal papers in top-tier journals and about 70 more in international conferences.



PRIME LOCATION

The central Florida region is a world hub for turbine, energy and space technology development, and is home to a unique concentration of large utility turbine manufacturers.

Orlando anchors the I-4 High Tech Corridor with an industrial base that includes defense, space, simulation and training, and more. The Central Florida Research Park, adjacent to UCF, is the nation's 7th largest with more than 10,000 employees and 120 companies. Research opportunities, jobs and internships are abundant.

FACTS OF INTEREST

UCF is the nation's #1 workforce supplier to the aerospace and defense industry (*Aviation Week* 2015, 2016, 2017). In addition, UCF is the #1 workforce supplier worldwide for Lockheed Martin, Harris Corporation and Siemens Energy.

UCF received an in-kind grant of software - valued at \$68 million - from Siemens to help hundreds of engineering students become stronger job applicants. The software is incorporated into student coursework and research related to computer-aided design, engineering simulation, industrial design, digital manufacturing and manufacturing management, specifically for the design and manufacturing of products for energy and power generation, automotive, aerospace, machinery and high-tech electronics.

UCF engineering facilities house the Maker Space Lab Complex (Harris Gathering Lab, Idea Lab, Texas Instruments Innovation Lab and Manufacturing Lab) to spur teamwork, creativity, rapid prototyping and marketable innovations.

UCF is home to Limbitless Solutions, a UCF-based nonprofit led by MAE alumnus Albert Manero, Ph.D., that creates 3D-printed bionic limbs for children at no cost to families. In 2015, they received worldwide media attention when Microsoft featured the team in a video showing world-famous film star Robert Downey Jr. giving a boy a UCF-made Iron Man-styled bionic arm.

GRADUATE DEGREES OFFERED

MASTER'S

Aerospace Engineering
Biomedical Engineering
Mechanical Engineering

DOCTORAL

Aerospace Engineering
Mechanical Engineering

FACULTY HONORS

Our faculty are members and fellows of scientific societies, including:
American Institute of Aeronautics and Astronautics, American Society of Mechanical Engineers, American Chemical Society, American Physical Society, ASM International, International Society for Optics and Photonics, Institute of Electrical and Electronics Engineers, American Society for Testing and Materials, American Society of Heating, Refrigeration and Air Conditioning Engineers, International Association for Boundary Element Methods.

ALUMNI AND STUDENTS SAY

"I have learned how to 'dream big dreams' and about global innovation, which has encouraged me to pursue my aerospace and biomedical engineering research on a global scale."

– Albert Manero, Ph.D., '12, '14, '16,
Fulbright Scholar,
Founder, Limbitless Solutions

"I'd like to use my talents to develop products using methods of energy reclamation to solve problems in developing countries. I stand by my UCF experience and feel truly prepared to handle the future as I move forward in my career."

– Daniel Geiyer,
doctoral student

"I chose UCF mostly because of the strength of its College of Engineering and Computer Science - and because of its proximity to Kennedy Space Center - where I hope to work someday."

– Leigh Nash, '14, '17,
NASA Fellowship scholar





MAJOR RESEARCH INITIATIVES

With a \$1.5 million National Institute on Aging grant, Asst. Prof. Helen Huang will collect brain-wave and muscle activity data to understand how people maintain balance and adapt their movement patterns during walking and exercise. It may lead to new approaches for predicting fall risk in aging adults.

Assistant Prof. Subith Vasu's \$1 million Young Faculty Award from Defense Advanced Research Projects Agency allows him to develop an intelligent handheld device that can detect trace amounts of fentanyl and Carfentanil and similar deadly toxins in the air, to keep first responders and military personnel safe.

Asst. Prof. Shawn Putnam's 2017 National Science Foundation CAREER award focuses on new cooling technologies based on evaporation and flow boiling in micro-channel devices for faster, more powerful and smaller electronic devices.

A \$1.3 million grant from the U.S. Department of Energy allows MAE researchers Kareem Ahmed, Subith Vasu and Jay Kapat to conduct experiments and provide data on Co-Optima fuels, designed to maximize vehicle performance while minimizing environmental impact.

A \$1.36 million U.S. Dept of Energy award allows Prof. Quanfang Chen to develop advanced metallic nanocomposite conductors that reduce energy waste in electric motors due to resistive heating by a third, while increasing power output, motor reliability and efficiency.

Asst. Prof. Robert Steward Jr.'s \$740,000 grant from the National Institutes of Health addresses early stages of heart disease. He hopes to create therapies to treat or prevent bad cholesterol and white blood cells from entering the heart's vessels at mechanically weak locations.



POWERFUL PARTNERSHIPS

UCF's historically strong ties with NASA and its close proximity to Florida's Space Coast fuels its robust partnerships with aerospace-related agencies and industries. Partners include NASA, National Science Foundation, U.S. Department of Energy, U.S. Army, Air Force Research Laboratory, Air Force Office of Scientific Research, Office of Naval Research, Siemens, Lockheed Martin, Boeing, Mitsubishi Power Systems, and many more.

CENTER FOR ADVANCED TURBOMACHINERY AND ENERGY RESEARCH (CATER)

Led by Prof. Jayanta Kapat, the center intersects 10 core technical areas that advance scientific knowledge and innovation in turbomachineries and associated technologies to bring higher reliability, higher efficiency and lower emissions in power generation, aviation and space.

Research areas include fuel flow and combustion; materials, properties and manufacturing; and dynamic systems and control.

Dr. Kapat has more than 23 years of experience and expertise in aerodynamics and heat transfer for gas turbines and turbomachineries, cooling techniques, system calculation and alternative fuels.

RESEARCH GROUPS AND LABORATORIES

The department oversees 16, including: MEMS and Nanomaterials Lab, Ceramic Processing for Energy Applications, Composite Materials and Structures Lab, and CATER (see above).

ALUMNI STARS

JASON DUNN, AE, '07, '09

The first 3D printer in outer space was delivered by Dunn's company, Made In Space, Inc., with a \$10 million NASA contract. The printer was specially crafted for space flight and first tested in 2014. The first tool manufactured in space by the 3D printer was a wrench used on the International Space Station.

ALBERT MANERO, AE, '12, '14, '16

Dr. Manero is founder and executive director of the UCF-based nonprofit Limbless Solutions. (See Pg. 1, Facts of Interest.)

DANIEL RINI, AE, '95, ME, '97, '00

Rini is the founder of RINI Technologies, Inc. The entrepreneur's company holds numerous patents in miniature refrigeration technology. They develop unique cooling and heating products for the United States military, including a personal cooling system for soldiers operating in hot environments, a personal heating system for divers and a cooling system for military lasers.

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College of Engineering and Computer Science