Aerospace Engineering

Master of Science in Engineering
Doctor of Philosophy

For More Information

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Objectives

The aerospace engineering graduate program focuses on teaching and research in analytical, computational, and experimental methods in the areas of aerothermodynamics and fluid mechanics; solids, structures, and materials; structural dynamics; guidance and control; and orbital mechanics. The student may concentrate in any of these five areas. The objectives of the program are to enable the student to attain a deeper understanding of aerospace engineering fundamentals, a knowledge of recent developments, and the ability as a master's degree student to participate in research and as a doctoral degree student to conduct individual research. The goals are accomplished through coursework, seminars, and active research programs.

Areas of Study and Facilities

Aerothermodynamics and Fluid Mechanics. This concentration involves study and research in experimental, theoretical, and computational aerodynamics, gas dynamics, turbulence, plasma dynamics, heat transfer, and combustion. Research is presently being conducted in nonequilibrium and rarefied gas flows, planetary atmospheres, turbulence control, shock-boundary layer interactions, thermal and glow-discharge plasmas, turbulent mixing/combustion, numerical methods for turbulent reacting flows, and advanced optical diagnostics and sensors. Facilities include Mach 2 and Mach 5 blowdown wind tunnels, a 50kw inductively coupled plasma torch, a 15" × 20" water channel, a laser sensor laboratory, combustion facilities, a plasma engineering laboratory, and extensive laser and camera systems for advanced flow diagnostics. Excellent computational facilities include a variety of workstations, and access to very-large-scale, high-performance computers at the Texas Advanced Computing Center.

Controls, Autonomy and Robotics. The Controls, Autonomy and Robotics (CAR) area within the Department of Aerospace Engineering and Engineering Mechanics at The University of Texas at Austin conducts research in controls, networks, autonomy, and robotics with applications to the automation, navigation, guidance, control, and flight mechanics of space and air vehicles and robotic systems.

Major research topics include dynamic games, secure perception, decision-making and path-planning under uncertainty, motion planning of robotic systems, uncertain control systems, data-driven control and model reduction, uncertainty quantification, machine learning and adaptive control, multi-vehicle coordination, swarming, and fractionation, optimal decision-making in multi-agent systems, information theory in control, vision- and radio-based navigation, controlled-mobility wireless networks, robust communications, autonomy, trust, and human-machine teaming. Several of these projects advance both foundational research and aerospace applications with funding from the Defense Advanced Research Projects Agency, the Air Force Office of Scientific Research, the National Science Foundation, the Office of Naval Research, the Missile Defense Agency, National Aeronautics and Space Administration, the U.S. Space Force, the Jet Propulsion Laboratories, and the Army Research Lab. Faculty from the CAR area also maintain fruitful engagements and active collaborations with leading industry partners from the aerospace and robotics sectors.

Robotics at UT Austin also offers the Graduate Portfolio Program in Robotics which provides graduate students the opportunity to obtain an official "certification of expertise" in robotics with their Masters or Ph.D. degree from their home departments.

Orbital Mechanics. This area involves study and research in the applications of orbital mechanics and remote sensing in the context of spacecraft and celestial bodies. Applications and customers include NASA, military, a variety of governmental agencies, and the rapidly growing commercial space industry. Research in spaceflight mechanics includes trajectory and mission design, nonlinear optimization, numerical methods, perturbations, dynamical systems theory, high fidelity simulation, and high performance computing. Research in nonlinear estimation provides observable properties of dynamical systems in order to enable autonomous operations of spacecraft and ground-based tracking for satellite applications and situational awareness. Research in space domain awareness and space traffic management seeks to develop and deliver the decision-making science for the space community. Example topics include space object detection, tracking, identification, and characterization via multi-source information collection, curation, and fusion. Research in satellite applications include the development of space geodetic and both active and passive satellite remote sensing techniques, such as Interferometric Synthetic Aperture Radar (InSAR), laser and microwave tracking of satellites, and the Global Navigation Satellite Systems (GNSS). Application areas include measurement and interpretation of global Earth System variables such as the gravity field, loading, Earth rotation, and terrestrial reference frames; their application to research in the atmosphere, biosphere, cryosphere, and hydrosphere, as well as their mutual interactions; and GNSS signals, assurance, and applications for navigation and precise positioning. Research is supported by a large database of satellite remote sensing measurements, state-of-the-art high performance computing resources, GPS receivers, and image processing equipment.

Solids, Structures, and Materials. This concentration involves study and research in mechanics of composite materials, fracture mechanics, micromechanics of materials, constitutive equations, mechanical behavior at high strain rates, structural analysis, and structural stability. Experimental facilities include equipment for static structural testing; digital data acquisition equipment; uniaxial and biaxial materials-testing machines; custom loading devices; environmental chambers; microscopes; photomechanics facilities; composites processing equipment; facilities for microstructural analysis; and high-speed imaging and high-strain-rate mechanical testing facilities. Computing facilities include workstations, high-performance computers, and networks of workstations.

Structural Dynamics. This concentration involves study and research in theoretical, computational, and experimental structural dynamics, including aeroelasticity, rotor dynamics, morphing structures, adaptive structures, vibration and noise control, and computational techniques for very-large-scale vibration analysis. Computational and experimental facilities include high-performance shared- and distributed-memory multiprocessor systems, actuators, sensors, balances, and data-acquisition systems for structural testing, system identification, and control. Facilities for testing aeroelastic models on a whirl test stand or in a wind tunnel are also available.

Graduate Studies Committee

The following faculty members served on the Graduate Studies Committee (GSC) in the spring 2023 semester.

Maruthi R Akella	Kenneth M Liechti
Efstathios Bakolas	Nanshu Lu
Srinivas V Bettadpur	Lori A Magruder
Fabrizio Bisetti	Mark E Mear
Tan Thanh Bui	J T Oden
Jingyi Chen	Laxminarayan L Raja
John-Paul Clarke	Manuel Karl Rausch
Noel T Clemens	Krishnaswa Ravi-Chandar
Clinton N Dawson	Ryan P Russell
Leszek F Demkowicz	Luis Sentis
David Fridovich-Keil	Jayant Sirohi
David B Goldstein	Takashi Tanaka
Rui Huang	Ufuk Topcu
Thomas J Hughes	Thomas Carlton Underwood
Todd E Humphreys	Philip L Varghese
Moriba Jah	Mary F Wheeler
Brandon A Jones	Karen E Willcox
Stelios Kyriakides	Jin Yang
Chad Matthew Landis	Renato Zanetti

Admission Requirements

The prerequisite for graduate study in aerospace engineering is a bachelor’s or master’s degree in aerospace engineering or in a related field of engineering or science. Graduate study in orbital mechanics is possible for those with degrees in engineering, science, or mathematics.