The Walker Department of Mechanical Engineering and Biomedical Engineering offers graduate study and research in a number of areas. Graduate students have primary access to the Chandra Department of Electrical and Computer Engineering and the Department of Materials Science and Engineering. This concentration provides studies in the fields of materials development, characterization and fabrication, and in innovative manufacturing processes. Areas of study include applied mechanics, biomedical engineering, in the analysis, design, and control of engineered and natural systems. Courses in MDSE cover topics drawn from mechanical systems and design, thermal and fluid systems, materials science and engineering, operations research and industrial engineering, and leadership and entrepreneurship. Major research facilities are available for graduate students in this field.

**Manufacturing and design.** The concentration in manufacturing and design offers state-of-the-art programs in innovative manufacturing processes, product design and development, and supporting technologies. Areas of study include product design methods, layer-based manufacturing (solid freeform fabrication), machine design, unit manufacturing processes, robotics, contemporary prototyping, reverse engineering, optimization techniques, computer-aided design and manufacturing (CAD/CAM), computational geometry, machine intelligence, and design for people with disabilities. Well-equipped laboratories are available for research in solid freeform fabrication (including selective laser sintering), product modeling and simulation, unit manufacturing processes, robotics, one-off prototyping (such as CNC processes, woodworking equipment, power tools, and product measurement equipment), scaled manufacturing (from macro to meso to micro), biomedical device fabrication, and laser-based processes. These laboratories are part of the Advanced Manufacturing Center.

An alternatively scheduled master’s degree program in advanced manufacturing engineering, a subarea of manufacturing and design, also exists but is inactive. More information is available from the graduate advisor.

**Materials engineering.** This concentration encompasses graduate study in the fields of materials development, characterization and processing, and in structure-property-performance relationships. Areas of study include ceramics, physical metallurgy, mechanical behavior, materials processing, fuel cells, high-energy density batteries, new materials development, nanomaterials and nanotechnology, corrosion, and microelectronics packaging. Laboratory facilities include scanning and transmission electron microscopes; X-ray scattering, metallographic, laser processing, thermal analysis, and thin-film characterization facilities; and mechanical, electrical, magnetic, and electrochemical property measurement equipment. The Walker Department of Mechanical Engineering is also a primary participant in the interdisciplinary materials science and engineering graduate degree program.

**Nuclear and radiation engineering.** This concentration provides graduate study and research in nuclear radiation science, analysis and design of nuclear systems, and experimental techniques in nuclear technology. Emphasis is on radiation transport and measurements, neutron physics, health physics and dosimetry, transport and disposal of nuclear wastes, and nuclear material safeguards and disposition. The Nuclear Engineering Teaching Laboratory is equipped with a 1.1-MW TRIGA pulsing nuclear reactor; a cold neutron source with prompt gamma analysis; neutron radiography equipment; neutron activation analysis equipment, including a pneumatic transfer system; Californium-252 neutron sources; a low-level gamma-ray counting system and many radiation detection systems; and extensive computational capabilities.

**Thermal/fluid systems.** This concentration offers graduate study and research in the areas of thermodynamics, heat and mass transfer, fluid mechanics, combustion, energy conversion, energy conservation, alternative energy, microscale heat transfer, microfluidics, advanced laser-materials processing, and thermoelectrics. Experimental facilities include subsonic wind tunnels, three-dimensional laser-Doppler anemometry, a micro/nano fabrication facility, scanning probe microscopy, a cryogenic measurement facility, instrumentation calibration facilities for semiconductor rapid thermal processing, fundamental combustion research facilities, engine and emission test
facilities, solar energy components and systems, and various fluid mechanics and heat transfer equipment. The University's computational resources for numerical investigations are state-of-the-art and extensive.

Graduate Studies Committee

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

- Farshid Alambeigi
- Narayana R Aluru
- Vaibhav Bahadur
- Jonathan F Bard
- Joseph J Beaman Jr
- Adela Ben-Yakar
- J Eric Bickel
- George Biros
- David G Bogard
- Ragu Bollapragada
- Maura Borrego
- Chih-Hao Chang
- William S Charlton
- Dongmei Chen
- Kevin Clarno
- Richard H Crawford
- Michael Arthur Cullinan
- Ashish Deshpande
- Kenneth R Diller
- Dragan Djurdjanovic
- Janet L Ellzey
- Ofodike A Ezekoye
- Eric P Fahrenthold
- Donglei Emma Fan
- Nicholas P Fey
- Omar Ghassas
- John B Goodenough
- Derek A Haas
- Michael Richard Haberman
- Matthew J Hall
- Neal Hall
- Mark F Hamilton
- John J Hasenbein
- Robert E Hebner
- Tanya Hutter
- Hadi Khani
- Dale E Klein
- Desiderio Kovar
- Erhan Kutugolu
- Sheldon Landsberger
- Benjamin D Leibowicz
- Wei Li
- Yuanyue Liu
- Raul G Longoria
- Nanshu Lu
- Ann Majewicz Fey
- Filippo Mangolini
- Arumugam Manthiram
- Alexander Marras
- David Mitlin
- Robert D Moser
- Richard R Neptune
- Mitchell W Pryor
- Varun Rai
- Christopher G Rylander
- Marissa N Rylander
- Michael S Sacks
- Carolyn Conner Seepersad
- Luis Sentis
- Zhenghui Sha
- Li Shi
- Donald Jason Siegel
- S V Sreenivasan
- Venkat Subramanian
- James Samuel Sulzer
- Eric M Taleff
- Mehran Tehrani
- Eric van Oort
- Junmin Wang
- Yaguo Wang
- Jamie Warner
- Michael Webber
- Preston S Wilson
- Guihua Yu
- Yuebing Zheng
- Jianshi Zhou
- Lei Zhou

Admission Requirements

To enter the graduate program in mechanical engineering, a student should have an undergraduate degree in engineering or in an equivalent quantitative field of study. Students who do not meet this requirement may have to take additional courses at the discretion of the graduate advisor. Admission to the integrated Bachelor of Science in Mechanical Engineering and Master of Science in Engineering (BSME/MSE) program is only open to current Mechanical Engineering undergraduate students.