



## GRADUATE PROGRAMS



Graduate programs leading to the Doctor of Philosophy (Ph.D.) and Master of Science (M.S.) degrees have enrollments of more than 80 doctoral and 70 master's students. The M.S. program offers interdisciplinary, applied, and classical tracks that may include courses across departments and colleges at Lehigh, and the option of thesis/project or coursework only. The Ph.D. program includes development of the student's ability to move into a new area of research, identify major unknowns, and formulate a proposal in relation to a major funding agency. Both M.S. and Ph.D. programs offer full time, part time, and distance learning modes.

MechE faculty mentor graduate students towards international recognition across a network of colleagues; our faculty has received more than 45 awards for outstanding accomplishments from professional societies and federal agencies, including 13 prestigious National Science Foundation CAREER Awards and Department of Defense Young Investigator Awards. Our graduate students give more than 60 presentations per year at national and international conferences, revealing their recent advances on research projects arising from collaboration with student and faculty teams.

Financial aid, in the form of research assistantships, teaching assistantships, teaching practica and endowed fellowships, is available for doctoral track students.

## STUDENT RESEARCH PATHWAYS

Graduate students within our department engage in basic research that leads to breakthrough innovation in areas that include:

**Controls and Robotics:** Systems control and motion planning of teams of drones and cars, robotic arm and cable systems, control of plasmas in nuclear fusion.

**Fluid Mechanics and Flow-structure Interaction:** mixing processes for nuclear fusion, renewable energy from rivers and oceans, biological swimming and flying, quiet flight in nature, impaired water treatment and desalination using membranes, nanosuspension fluid flows in advanced fabrication methods, biological nanoparticles in microfluidics, cardiovascular and cellular flows, enhanced polymer molding for manufacturing.

**Solid Mechanics:** Air vehicles and high speed boats constructed of carbon fiber composites, three-dimensional interface cracks in laminated structures, structures/composites in multiphysics and extreme environments, stress evolution in nanostructures and thin films, friction and wear of materials in space, ultralow wear nanocomposites and coatings for extreme applications.

**Thermo-Heat Transfer:** Heat conduction with nanoscale interfacial effects, design of thermostructural components for hypersonic vehicles.

**Biomechanics:** Bone fracture healing after surgical repair, lab on a chip for cancer detection and drug screening, cell and protein response to mechanical stimuli, biopolymer relationships in human blood.

## EXTERNAL SUPPORT AND COLLABORATION

Collaborations with external research organizations include the Air Force Research Laboratory, Air Products, American Museum of Natural History, Brookhaven National Laboratory, DuPont, Electric Power Research Institute, MD Anderson Cancer Center, NASA Langley, National Energy Technology Laboratory, National Institute of Standards and Technology, Princeton Plasma Physics Laboratory, and University of Zurich.

Funding support from major national agencies and industry leaders including National Science Foundation, National Institutes of Health, Department of Energy, Office of Naval Research, Advanced Research Projects Agency, Intel, Army Research Office, Air Force Office of Scientific Research, and others; winners of National Science Foundation Graduate Fellowships have joined our department.

Upon graduation, our students embark upon careers with organizations such as Apple, Army Research Laboratory, Arnold Engineering Development Complex, Boeing, Bosch, Carnegie Mellon University, Columbia University Medical Center, Corning, Curtiss Wright, General Electric, Harvard University, Lawrence Berkeley National Laboratory, Lockheed Martin, MIT, Musculoskeletal Research Unit at University of Zurich, Naval Research Laboratory, Oak Ridge National Laboratory, Pratt and Whitney, Princeton Plasma Physics Laboratory, Sandia National Laboratories, Scaled Composites, Shenzhen Institute of Advanced technology (SAIT)- Chinese Academy of Sciences, and Siemens.

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