

AEROSPACE ENGINEERING (GRADUATE FIELD)

Program Website (<https://www.mae.cornell.edu/mae/programs/graduate-programs/>)

Field Description

The program emphasizes balance in aerospace science and technology, both basic and applied, to prepare students for the diverse opportunities at the frontiers of research, in contemporary industrial development, and in government agencies. The faculty is particularly strong and active in aerospace vehicle dynamics and feedback control, wind energy, celestial mechanics, the Global Positioning System, and spacecraft systems engineering, as well as in basic aerosciences including transonic flows, turbulence, nonequilibrium gas dynamics, unsteady and vortical flows, combustion processes, transport processes in microgravity and chemical kinetics.

Aerospace Vehicle Dynamics and Control

Modeling, analysis, theoretical investigations, and applied technology development related to the flight mechanics of spacecraft and air vehicles and motivated by contemporary problems relevant to the private and public sectors; flight experiments and mission operations of spacecraft in Earth orbit and beyond; numerical and experimental investigation of autonomous air vehicles, mechatronics architectures that enable advanced flight technologies.

Wind Energy

Basic and applied studies of wind-energy systems, including multiscale aerodynamics, coupled fluid/structure interactions, meteorological implications for on-and off-shore wind energy, energy-output prediction for turbines and other technologies, instrumentation and remote sensing for design and siting of wind farms; wind-energy harvesting through non-traditional approaches such as aeroelastic effects.

Celestial Mechanics

Kinematics and dynamics of orbital motion for planetary bodies and spacecraft; behaviors of orbiting bodies among subtle gravitational sources, such as asteroids; design of trajectories and timing for space-exploration applications.

Global Positioning System

Estimation of GPS-based position and velocity through realtime algorithms; characterization of the Earth's ionosphere, atmosphere, and surface processes through analysis of GPS signals; design and implementation of software-defined radios as GPS receivers; high-precision navigation of spacecraft formations.

Spacecraft Systems Engineering

Conceiving, designing, implementing and operating space systems, which includes individual spacecraft as well as formations, constellations, and swarms; analysis of and innovation in spacecraft architectures, including Earth-observing satellites; studies in reliability, manufacturability, operability, and other features of contemporary space-system concepts.

Basic Aerosciences

Studies in transonic flows, turbulence, nonequilibrium gas dynamics, unsteady and vortical flows, combustion processes, transport processes in microgravity, and chemical kinetics; modeling and simulation of

aerospace fluid systems; development of predictive tools, such as computational fluid-dynamics codes; applications include design of aircraft, analysis and optimization of propulsion and aircraft power plants; fluid/thermal behaviors in combustion systems.

The Ph.D. program provides advanced levels of training suitable for students pursuing careers in research and development, education, or government service. The field does not admit students into an M.S.-only degree program; applicants may apply for the Ph.D. program with a bachelor's degree. Ph.D. students must take a qualifying examination in addition to the examinations required by the Graduate School. Typically the qualifying exam is taken at the end of the first semester for students entering with a Master's degree and at the end of the first two semesters for those entering with a Bachelor's degree. Teaching experience for two semesters is required of Ph.D. students.

The professional degree of Master of Engineering (Aerospace) provides a one-year course of study for those who want to develop a high level of competence in current technology and engineering design and who plan to practice engineering in industry or professionally. The program has a thirty-credit curriculum and requires an engineering design project.

Data and Statistics

- **Doctoral Program Statistics**

Field Manual

- **Manual**

Subject and Degrees

- Aerospace Engineering (PhD) (<https://catalog.cornell.edu/programs/aerospace-engineering-phd/>)
- Robotics (PhD) (<https://catalog.cornell.edu/programs/robotics-phd/>)

Concentrations by Subject

Aerospace Engineering

- aerodynamics (PhD only)
- aerospace systems (PhD only)
- biomedical mechanics (PhD only)
- dynamics and control (PhD only)
- materials and structures (PhD only)
- propulsion (PhD only)
- thermal sciences (PhD only)

Robotics

- robotics

Faculty

John David Albertson (<http://www.cee.cornell.edu/faculty-directory/john-d-albertson/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: thermal sciences (PhD only)
- **Research Interests:** understanding exchange rates of mass, energy, and momentum between land and atmosphere

Nelly Andarawis-Puri (<http://www.engineering.cornell.edu/faculty-directory/nelly-andarawis-puri/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: biomedical mechanics (PhD only)
- **Research Interests:** Tendon Biomechanics, Orthopaedic Soft Tissue Injury, Fatigue Biomechanics

C. Thomas Avedisian (<http://www.mae.cornell.edu/faculty-directory/c-thomas-avedisian/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: thermal sciences (PhD only)
- **Research Interests:** heat transfer; fluid mechanics and combustion

Shefford P Baker (<http://www.mse.cornell.edu/faculty-directory/shefford-p-baker/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: materials and structures (PhD only)
- **Research Interests:** mechanical behavior of materials for structural, nano-scale, and biological applications

Rebecca Jane Barthelmie (<http://www.mae.cornell.edu/faculty-directory/rebecca-j-barthelmie/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: aerodynamics (PhD only); dynamics and control (PhD only); materials and structures (PhD only)
- **Research Interests:** Wind energy resources

Gregory Paul Bewley (<http://www.mae.cornell.edu/faculty-directory/gregory-paul-bewley/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: thermal sciences (PhD only)
- **Research Interests:** turbulence, both its intrinsic properties and its role in various environmental settings

Anastasia Sergeyevna Bizyaeva (<http://www.mae.cornell.edu/faculty-directory/anastasia-bizyaeva/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: dynamics and control (PhD only); *Robotics*: robotics
- **Research Interests:** Autonomous systems, control, collective behavior, complex systems/network science and computation, nonlinear dynamical systems, biological and artificial swarm intelligence, data-driven modeling

Lawrence Bonassar (<http://www.bme.cornell.edu/faculty-directory/lawrence-bonassar/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: biomedical mechanics (PhD only); materials and structures (PhD only)
- **Research Interests:** synthesis and mechanics of polymers and composites

Nikolaos Bouklas (<http://www.mae.cornell.edu/people/profile.cfm?netid=nb589>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: materials and structures (PhD only)
- **Research Interests:** Theoretical and computational solid Mech

Mark Campbell (<http://www.engineering.cornell.edu/faculty-directory/mark-campbell/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: aerospace systems (PhD only); dynamics and control (PhD only)
- **Research Interests:** space systems; estimation and control; autonomy in aerospace systems; controlled structures

Olivier Desjardins (<http://www.mae.cornell.edu/mae/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: propulsion (PhD only); thermal sciences (PhD only)
- **Research Interests:** Computational Fluid Dynamics

David Erickson (<http://www.mae.cornell.edu/faculty-directory/david-erickson/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: thermal sciences (PhD only)
- **Research Interests:** micro/nanofluidics; optical fluidics; labs-on-a-chip; nanoscale integration; single nucleotide polymorphisms

Gregory Joseph Falco (<http://www.engineering.cornell.edu/faculty-directory/gregory-falco/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: aerospace systems (PhD only); dynamics and control (PhD only); materials and structures (PhD only); propulsion (PhD only)
- **Research Interests:** Satellite Systems, Artificial Intelligence, Security, Statistics and Machine Learning, Robotics and Autonomy, Systems and Networking, Space Science and Engineering, Infrastructure Systems, Remote Sensing, Signal and Image Processing, Information Theory and Communications, Optical Physics, Cloud and Distributed Computing

Silvia Ferrari (<http://www.engineering.cornell.edu/faculty-directory/silvia-ferrari/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: dynamics and control (PhD only)
- **Research Interests:** design and analysis of methods and algorithms for computational intelligence and sensorimotor learning and control

Maha Haji (<http://sea.mae.cornell.edu/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: aerospace systems (PhD only); dynamics and control (PhD only)
- **Research Interests:** Offshore Structure and System Design, Ocean Resource Extraction, Sustainability

Seyyed Mostafa Hassani Gangaraj (<http://www.mae.cornell.edu/mae/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: materials and structures (PhD only)
- **Research Interests:** Solid Mechanics, Structural materials, and Additive Manufacturing

Alexander Hayes (<http://astro.cornell.edu/alexander-hayes/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: aerospace systems (PhD only)
- **Research Interests:** planetary sciences

Elizabeth Farrell Helbling (<http://www.ece.cornell.edu/faculty-directory/elizabeth-farrell-helbling/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: dynamics and control (PhD only)
- **Research Interests:** Robotics

Guy Hoffman (<http://infosci.cornell.edu/content/hoffman/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: dynamics and control (PhD only)
- **Research Interests:** Computational, design, and social aspects of Human-Robot Interaction (HRI)

Chung-Yuen Hui (<http://www.mae.cornell.edu/people/profile.cfm?netid=ch45>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: biomedical mechanics (PhD only); materials and structures (PhD only)
- **Research Interests:** adhesion science, fracture mechanics and mechanics of soft matter

David Lee Hysell (<http://www.engineering.cornell.edu/faculty-directory/david-lee-hysell/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: aerospace systems (PhD only)
- **Research Interests:** radar and remote sensing; upper atmospheric physics; plasma physics; numerical simulations

Brian J. Kirby (<http://www.engineering.cornell.edu/faculty-directory/brian-kirby/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: aerodynamics (PhD only); biomedical mechanics (PhD only); propulsion (PhD only); thermal sciences (PhD only)
- **Research Interests:** micro- and nanofluidics; microbioanalytical devices; laser microfabrication; interface science

Donald L. Koch (<http://www.cheme.cornell.edu/faculty-directory/donald-l-koch/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: aerodynamics (PhD only); thermal sciences (PhD only)

- **Research Interests:** particulate and multiphase flows; colloids and aerosols; non-continuum gas flows

Hadas Kress-Gazit (<http://www.engineering.cornell.edu/faculty-directory/hadas-kress-gazit/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: dynamics and control (PhD only)
- **Research Interests:** autonomous systems; hybrid systems; control; robotics

James Lloyd (<http://astro.cornell.edu/james-p-lloyd/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: aerospace systems (PhD only)
- **Research Interests:** adaptive optics, astronomical instrumentation, and extrasolar planets

Douglas MacMartin (<http://www.atkinson.cornell.edu/about/people/fellows/view.php?NetID=dgm224>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: dynamics and control (PhD only)
- **Research Interests:** dynamics, feedback analysis, control design related to climate science

Negin Majedi (<http://www.mae.cornell.edu/faculty-directory/negin-majedi/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: biomedical mechanics (PhD only); materials and structures (PhD only)
- **Research Interests:** Immune suppression under microgravity

Matthew Peter Miller (<http://www.mae.cornell.edu/faculty-directory/matthew-peter-miller/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: materials and structures (PhD only)
- **Research Interests:** experimentally based material model development; effect of processing on properties

Atieh Moridi (<http://www.mae.cornell.edu/faculty-directory/atieh-moridi/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: materials and structures (PhD only)
- **Research Interests:** advanced materials and manufacturing

Cara Mae Nunez (<http://www.mae.cornell.edu/faculty-directory/cara-m-nunez/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: biomedical mechanics (PhD only); dynamics and control (PhD only); materials and structures (PhD only)

- **Research Interests:** bioengineering and healthcare, biomedical engineering, biomedical imaging and instrumentation, neuroscience, robotics and autonomy, sensors and actuators

Samuel Epstein Otto (<http://www.mae.cornell.edu/faculty-directory/sam-otto/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: aerodynamics (PhD only); dynamics and control (PhD only)
- **Research Interests:** scientific machine learning and model reduction for continuum systems

Mason A. Peck (<http://www.mae.cornell.edu/faculty-directory/mason-peck/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: aerospace systems (PhD only); dynamics and control (PhD only); materials and structures (PhD only)
- **Research Interests:** dynamics and control; spacecraft design; systems engineering

Perrine Pepiot (<http://www.engineering.cornell.edu/faculty-directory/perrine-pepiot/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: propulsion (PhD only); thermal sciences (PhD only)
- **Research Interests:** Computational Fluid Dynamics

Kirstin Hagelskjaer Petersen (<http://www.ece.cornell.edu/faculty-directory/kirstin-hagelskjaer-petersen/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: dynamics and control (PhD only)
- **Research Interests:** design and coordination of large robot collectives able to achieve complex behaviors, swarm intelligence, embodied intelligence and autonomous construction

Elaine Marie Petro (<http://www.mae.cornell.edu/faculty-directory/elaine-petro/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: aerodynamics (PhD only); aerospace systems (PhD only); propulsion (PhD only)
- **Research Interests:** Space Science and Engineering

Fabien Royer (<http://www.engineering.cornell.edu/faculty-directory/fabien-royer/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: aerospace systems (PhD only); dynamics and control (PhD only); materials and structures (PhD only)
- **Research Interests:** Space Science and Engineering, Advanced Manufacturing and Materials, Solid Mechanics

Dmitry Savransky (<http://www.mae.cornell.edu/faculty-directory/dmitry-savransky/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: dynamics and control (PhD only)
- **Research Interests:** Estimation and control theory; computer vision and machine learning applications for automated optical system alignment and image processing; optimal scheduling for autonomous space observatories; and statistical analysis of astronomical data sets

Britney E. Schmidt (<http://schmidt.eas.gatech.edu/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: aerospace systems (PhD only); materials and structures (PhD only); thermal sciences (PhD only)
- **Research Interests:** Astronomy, Space and Planetary Sciences, Earth & Atmospheric Sciences, Geophysics, Oceanography & Climate, Astrobiology

Robert Shepherd (<http://www.mae.cornell.edu/faculty-directory/robert-f-shepherd/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: dynamics and control (PhD only)
- **Research Interests:** Soft Robotics, Material Intelligence for Control Systems

Meredith Silberstein (<http://www.engineering.cornell.edu/faculty-directory/meredith-silberstein/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: materials and structures (PhD only)
- **Research Interests:** polymer physics, mechanochemistry, micromechanical experiments and modeling, continuum mechanics

Sadaf Sobhani (<http://www.mae.cornell.edu/faculty-directory/sadaf-sobhani/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: thermal sciences (PhD only)
- **Research Interests:** thermal management and energy conversion

Zhiting Tian (<http://ztgroup.org/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: materials and structures (PhD only); thermal sciences (PhD only)
- **Research Interests:** Micro/nanoscale heat transfer; thermal energy conversion and storage; thermal management

Marjolein van der Meulen (<http://www.bme.cornell.edu/faculty-directory/marjolein-van-der-meulen/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering*: biomedical mechanics (PhD only); materials and structures (PhD only)
- **Research Interests:** orthopedic biomechanics; skeletal functional adaptation; bone structural behavior; mechanics of musculoskeletal tissues

Jianxun Wang (<http://prod.cs.cornell.edu/content/wang-49/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering:* aerodynamics (Ph.D. only); biomedical mechanics; dynamics and control (Ph.D. only); thermal sciences (Ph.D. only)
- **Research Interests:** Scientific Machine Learning, AI for Science, Data Assimilation, Differentiable Physics, Computational Fluid Dynamics (CFD), Computational Mechanics Turbulence Modeling, Fluid-Structure Interaction.

Zheng Jane Wang (<http://physics.cornell.edu/jane-wang/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering:* aerodynamics (PhD only)
- **Research Interests:** biological fluid dynamics; scientific computing and modeling; statistical physics

Jake Welde (<http://www.jakewelde.com/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering:* aerospace systems (Ph.D. only); dynamics and control (Ph.D. only); *Robotics:* robotics
- **Research Interests:** robotics, autonomous systems, control theory, geometric mechanics, dynamical systems, symmetry and equivariance, aerial vehicles, structured machine learning, robot design

Jingjie Yeo (<http://www.mae.cornell.edu/faculty-directory/jingjie-yeo/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering:* biomedical mechanics (PhD only); materials and structures (PhD only)
- **Research Interests:** mechanical, chemical, optical, and electrical structure-function relationships of polymers, bio-polymers, and bio-inspired materials

Alan Taylor Zehnder (<http://www.mae.cornell.edu/people/profile.cfm?netid=atz2>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering:* aerodynamics (PhD only); materials and structures (PhD only)
- **Research Interests:** fracture and fatigue; experimental mechanics; metal cutting; mechanics of materials

Lenan Zhang (<http://www.engineering.cornell.edu/faculty-directory/lenan-zhang/>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering:* aerodynamics (PhD only); materials and structures (PhD only); thermal sciences (PhD only)
- **Research Interests:** Advanced Materials Computational Fluid Dynamics Energy and the Environment Energy Systems Heat and Mass transfer Imaging and Instrumentation Micro Nano Systems Microfluidics Multiphase and Granular Flows Nanotechnology Surface Science Sustainable Energy Systems Thermal Systems

Ke Max Zhang (<http://www.atkinson.cornell.edu/about/people/fellows/view.php?NetID=kz33>)

- **Campus:** Ithaca
- **Concentrations:** *Aerospace Engineering:* thermal sciences (PhD only)

- **Research Interests:** air pollution; environmental nanoparticles; transportation and air quality; energy systems; climate changes