THEORETICAL AND APPLIED MECHANICS (GRADUATE FIELD)

Program Website (https://www.engineering.cornell.edu/mae/)

Field Description

The Graduate Program in the Field of Theoretical and Applied Mechanics offers students a broad education in the mechanics of rigid and deformable bodies, applied mathematics, nonlinear dynamical systems, and modern experimental techniques.

Research in Theoretical and Applied Mechanics at Cornell is focused on the fundamental development and analysis of mechanical and mathematical models for a wide variety of scientific applications. Current research topics focus on the mechanics and dynamics of fluids and solids in a broad range of physical and biological systems. Examples include complex systems and networks, planetary rings and asteroids, fracture mechanics, contact mechanics, adhesion and friction of bio-inspired surfaces, soft material mechanics, granular mechanics, nonlinear dynamics, mechanics of cellular and biomolecular structures, the ballistic impact of fibrous systems, animal locomotion and cardiac dynamics and mechanics of soft materials, design of multifunctional, active and polymeric materials, biological interfaces and pattern surfaces, membrane fusion, rheology of complex fluids, suspension mechanics, micro-hydrodynamics, stability of capillary surfaces, and capillary adhesion devices.

TAM is the study of Engineering Science. TAM research often tends more toward science and engineering concepts and applied mathematics than direct engineering applications. Research tools include experiments, analytical mathematical solutions, and computer simulations.

All students are required to minor in at least one subject from a field outside of Theoretical and Applied Mechanics. Frequently selected minors are aerospace engineering, applied mathematics, applied physics, astronomy, electrical and computer engineering, geophysics, materials science, mathematics, mechanical engineering, physics, and structural engineering.

Ph.D. students take a qualifying examination, typically after completing two semesters for those students entering with a Bachelor's degree and at the end of one semester with those entering with a Master's degree. Ph.D. students are required to serve as teaching assistants for two semesters.

Data and Statistics

- Doctoral Program Statistics (https://gradschool.cornell.edu/about/program-metrics-assessments-and-outcomes/doctoral-program-statistics/?SelectGradField=37)

Field Manual

- Manual (https://gradhandbook.mae.cornell.edu/)

Subject and Degrees

Theoretical and Applied Mechanics

- Theoretical and Applied Mechanics (PhD) (https://catalog.cornell.edu/programs/theoretical-applied-mechanics-phd/)

Concentrations by Subject

Theoretical and Applied Mechanics

- dynamics and space mechanics
- fluid mechanics
- mechanics of materials
- solid mechanics

Faculty

Chloe Fanny Arson (http://www.engineering.cornell.edu/faculty-directory/chloe-arson/)

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: mechanics of materials; solid mechanics
- **Research Interests**: Structural engineering

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

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: mechanics of materials
- **Research Interests**: mechanical properties of materials; microstructure; defects; stresses; deformation; small scale behavior

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

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: fluid mechanics
- **Research Interests**: intrinsic properties and role in environmental setting of turbulence

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

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: dynamics and space mechanics
- **Research Interests**: Autonomous systems, control, collective behavior, complex systems/network science and computation, nonlinear dynamical systems, biological and artificial swarm intelligence, data-driven modeling

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

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: mechanics of materials; solid mechanics
- **Research Interests**: theoretical and computational solid mechanics to improve fundamental understanding of materials and structures

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

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: dynamics and space mechanics
- **Research Interests**: estimation; autonomy and aerospace systems; cooperative control

Christopher J. Earls (http://www.cee.cornell.edu/faculty-directory/christopher-j-earls/)

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: mechanics of materials; solid mechanics
- **Research Interests**: development and application of computational techniques for the study of problems involving solids and structures

Timothy James Healey (http://www.mae.cornell.edu/people/profile.cfm?netid=tjh10)

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: dynamics and space mechanics; solid mechanics
- **Research Interests**: nonlinear elasticity; bifurcation theory and nonlinear analysis; partial differential equations

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

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: mechanics of materials; solid mechanics
- **Research Interests**: elasticity and inelasticity; fracture; polymers; adhesion and contact mechanics

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

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: fluid mechanics
- **Research Interests**: micro-and nanofluidics; microbioanalytical devices; microfabrication

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

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: fluid mechanics
- **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**: *Theoretical and Applied Mechanics*: dynamics and space mechanics
- **Research Interests**: dynamics and control; spacecraft design; systems engineering

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

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: dynamics and space mechanics
- **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

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

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: mechanics of materials; solid mechanics
- **Research Interests**: development of disruptive manufacturing technologies and functional materials to enable new devices and user experiences

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

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: mechanics of materials; solid mechanics
- **Research Interests**: polymer physics, mechanochemistry, micromechanical experiments and modeling, continuum mechanics

Alexander B. Vladimirsky (http://math.cornell.edu/alexander-vladimirsky/)

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: dynamics and space mechanics
- **Research Interests**: building fast methods for problems in which the direction of information flow can be used to speed up computations

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

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: dynamics and space mechanics; fluid mechanics
- **Research Interests**: physical and biological fluid dynamics; mathematical biology; scientific computing and modeling; statistical physics

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

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: dynamics and space mechanics; solid mechanics
- **Research Interests**: fracture; experimental mechanics; optical and infrared techniques; mechanics of materials; MEMS; nanostructures

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

- **Campus**: Ithaca
- **Concentrations**: *Theoretical and Applied Mechanics*: fluid mechanics; mechanics of materials; solid mechanics
- **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