ENGINEERING MECHANICS, BS

With a degree in engineering mechanics, our graduates design, measure, and analyze complex structures in everything from networks of human cells and novel materials constructed at the nanoscale to roller coasters and spacecraft. Engineering mechanics is the home of aerospace engineering (http://guide.wisc.edu/undergraduate/engineering/engineering-physics/engineering-mechanics-bs/engineering-mechanics-aerospace-engineering-bs/) at UW–Madison. Our curriculum prepares students for careers in a wide variety of fields, including health, clean energy, space exploration, and many more.

Engineering mechanics is the study of forces and the resulting deformations, accelerations, motions, vibrations, and other responses they cause. It forms the foundation of aerospace, mechanical or civil engineering, and is fundamental to important parts of biomedical engineering, chemical engineering, materials science, and other engineering disciplines.

Graduates of engineering mechanics apply their expertise in a variety of areas.

Wind turbines, wave power systems, transmission towers, and pipelines all respond to their environments in different ways. The safety and performance of these systems depend on a detailed understanding of how the environmental forces lead to deformations and vibrations that might cause failure. Principles of aerospace engineering are important when wind and water are involved as their flows make the analysis even more challenging, requiring sophisticated mathematical and analytical tools.

At slightly smaller scales, engineering mechanics is fundamental to the design and innovation of vehicles of every type, from sports cars to tractors to aircraft and satellites. Understanding engineering mechanics principles can provide insight to expand the way these vehicles are used while making their operation more sustainable. For some vehicles, aerospace engineering sheds light on their aerodynamic interaction with their environment, as well as the propulsion systems and complexity of controlling vehicles in flight. Landing a rover on Mars requires engineering mechanics to design the rover itself as well as the delivery system.

Innovations in engineering mechanics allow many of the products in our everyday lives to be made lighter, stronger, or cheaper by carefully understanding how they perform and when they fail due to the forces from the outside. In addition to enabling new functionality and aesthetic design, these modifications open the door for improved energy efficiency, selection of green materials, and longer lifetimes, all with broader societal benefits.

Modern technology allows us to fabricate machines at the microscopic scale with moving parts that are only visible under a microscope. Understanding how these micromachines respond to forces from each other or their environment is important to ensure that they function correctly. At this same scale, we can build novel materials whose properties depend on the microscopic structures that define them rather than their chemical composition. Engineering mechanics allows us to design these materials with properties that are not found in nature.

Our curriculum starts with a rich physics and math base to prepare our graduates for advanced analytical and computational skills that they will apply to this range of technologies. We transition from these fundamentals to engineering problem-solving approaches that can be applied to increasingly complex systems, while students build skills in computational modeling and simulation.

As one of the smaller engineering majors, we focus on building a community that supports our students' success during their degree and as they launch their careers. Many students participate in undergraduate research across one of the biggest research portfolios in the College of Engineering. An alumni network across industry sectors — from John Deere to Tesla to Boeing to SpaceX — provides support for students to find internships and launch their careers.