

# Mechanical and Aerospace Engineering at U.Va.

Mechanical engineering is one of the oldest, largest and broadest engineering disciplines. A newer field by comparison, aerospace engineering is highly specialized yet widely diverse. Nonetheless, when mechanical and aerospace engineers approach their research, they often begin with the same questions — “**How does this work?**” and “**How can I make it better?**” Using the principles of energy and mechanics, knowledge of materials and command of modern computational tools, mechanical engineers design, analyze, optimize and manufacture machines and devices of all types — from turbomachinery to microelectronics to orthopaedic devices. Similarly, aerospace engineers develop innovative technologies specific to aviation, defense systems, space exploration and other diverse fields. Aerospace engineers are involved in such varied and exciting activities as creating the International Space Station, sending a spacecraft to Mars and improving tomorrow’s automobiles. From artificial hearts to jet transportation to electric razors, **mechanical and aerospace engineers have a tremendous impact on our everyday lives — and on the future.**

The U.Va. Department of Mechanical and Aerospace Engineering offers challenging but flexible curricula that provide students with a strong foundation in mathematics, science and engineering and also allow them to tailor their experience with technical electives, minor programs and hands-on student projects. The department offers Bachelor of Science degrees in aerospace engineering and in mechanical engineering as well as Master of Science, Master of Engineering and Ph.D. degrees in mechanical and aerospace engineering (combined program).

## Snapshot

At the U.Va. Department of Mechanical and Aerospace Engineering ...

- Approximately 300 undergraduate students are majoring in mechanical engineering or aerospace engineering
- Nearly 100 graduate students are earning advanced degrees in mechanical and aerospace engineering
- About 50 percent of aerospace engineering undergraduates pursue graduate studies
- About 25 faculty members teach, yielding an undergraduate student:faculty ratio of 12:1
- We receive approximately \$8 million in research support each year, or \$400,000 per faculty member who receives funding



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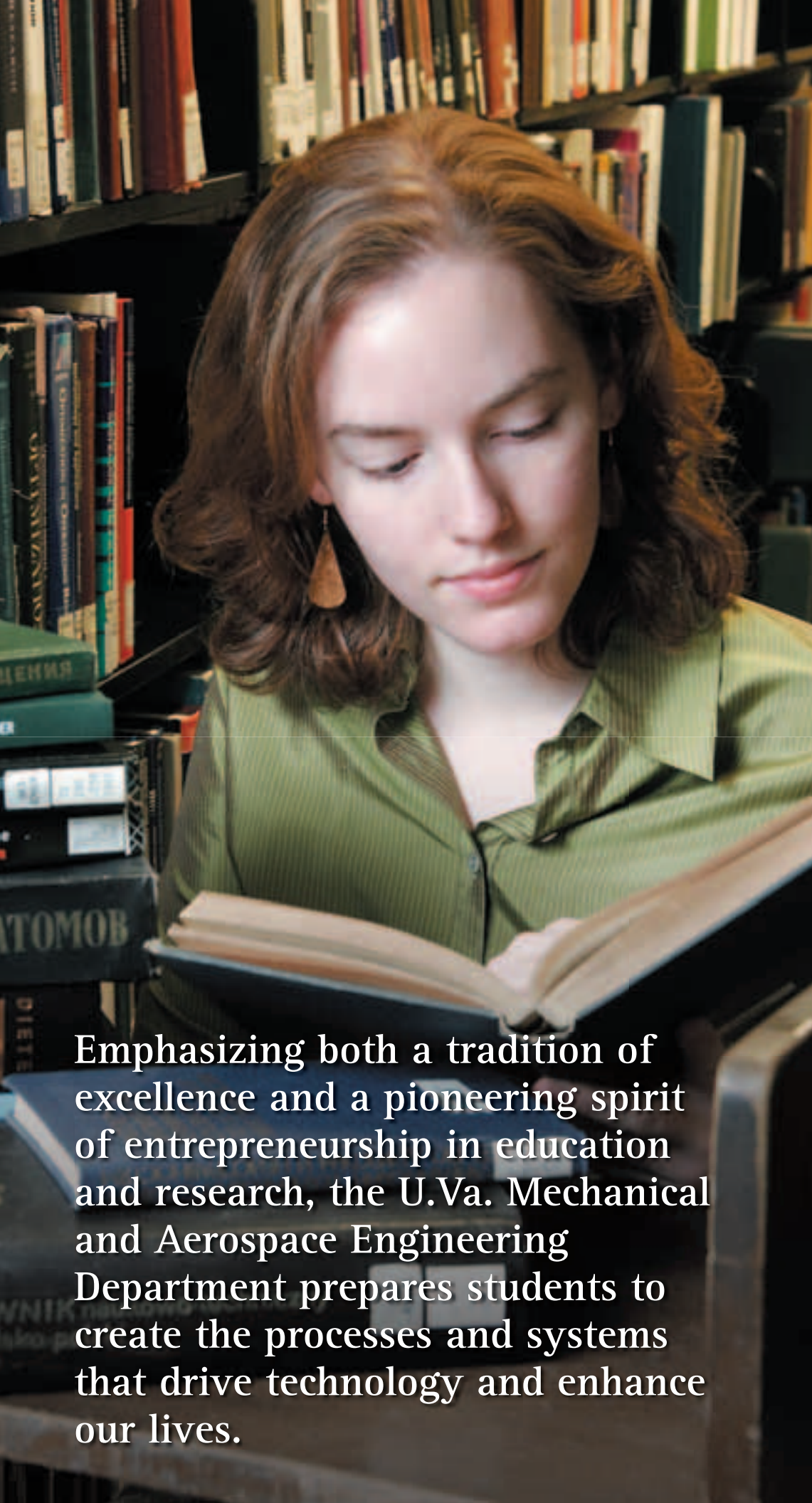
Department of

**Mechanical and Aerospace Engineering**

at the U.Va. School of Engineering and Applied Science



*Educating*  
**Leaders**



Emphasizing both a tradition of excellence and a pioneering spirit of entrepreneurship in education and research, the U.Va. Mechanical and Aerospace Engineering Department prepares students to create the processes and systems that drive technology and enhance our lives.

## Our Students

At the U.Va. Department of Mechanical and Aerospace Engineering, our mechanical engineering undergraduate students develop skills in mechanics, electrical theory, kinematics, thermodynamics, fluid mechanics, heat transfer and materials with the option of taking courses in engineering applications of automatic controls, computer programming, instrumentation, digital electronics, mechatronics, aircraft stability and design, and financial engineering. Aerospace engineering undergraduates receive an equally strong background in controls, design, flight dynamics, fluid dynamics, propulsion and structures. While each program features a solid technical foundation, courses in the humanities

and other non-technical fields make up approximately one quarter of the curricula — allowing students to understand the **real-world applications** of their work as well as the complex social, legal, ethical, political and international factors that impact the field and profession.

In addition, several laboratory courses familiarize students with the state-of-the-art equipment used in modern industry, and students may take advantage of the department's co-op program — the largest at the University, with more than 40 U.S. employers — over the course of a semester and summer.

Our graduate program centers around three general tracks: controls and dynamics, solid mechanics and thermofluids. Designed to accommodate non-traditional students and those with undergraduate degrees in other scientific or engineering fields, our curriculum offers a **large selection of courses**, within and beyond the department. The departmental courses deal with fundamental principles, analytical methods, computational techniques and practical applications and are designed to **challenge our students**, inform them of cutting-edge innovations and develop in them an appreciation of the rich history of our discipline.

## Our Research

Our renowned faculty and their graduate students are completing novel research in the general areas of solid mechanics, dynamics and controls, and thermofluids, with emphases in the following areas:

**Aeroacoustics, supersonic combustion,**  
**nanomechanics, micro-vehicles,**  
**biological and artificial sensors,**  
magnetic bearings, **aerogels,**  
**computational biomechanics,**  
*turbomachines*, automobile safety,  
**aerodynamics, neuronal control,**  
**laser diagnostics, control theory,**  
Web 2.0 tools in education,  
**heart-assist devices, microanalytical**  
**devices, heat-pipe technology,**  
*microturbine energy production and robotics*

Many of the department's research facilities are among the **only laboratories of their kind in the world**. The Center for Applied Biomechanics, for example, is an elaborately equipped, state-of-the-art research center dedicated to vehicle safety testing, biomechanics and related engineering studies. The Aerospace Research Laboratory conducts basic and applied research in advanced aerospace technologies, conducting **unique experiments** such as a simulation of a Mach 5 flight of a scramjet operating with ramp fuel injection of hydrogen. The Rotating Machinery and Controls Industrial Program supports cooperative research efforts emphasizing theoretical and experimental research in the areas of rotordynamics and turbomachinery. Through these and other research programs, our interactions with industry and University professionals provides a unique link to **practical industrial problems and their solutions**.

Mechanical and aerospace engineering graduate students work closely with faculty in their advanced laboratories and

to complete dissertation work. Undergraduate students are engaged in graduate-level research through the senior thesis and through sponsored research programs. Student projects can be individual or team endeavors and are often developed around a co-op, summer job or competition experience; for example, our students often participate in rocket, solar car, Mini Baja car, AIAA Design and Build competitions, and FIRST Robotics challenges, which in turn translate into exciting research opportunities.

