Department of Mechanical and Aerospace Engineering

The Department of Mechanical and Aerospace Engineering is the largest engineering department at NC State, among the largest in the nation, and offers doctor of philosophy, masters, undergraduate degrees, and online delivery of graduate courses for remote students.

The undergraduate curricula in mechanical engineering and in aerospace engineering are nearly the same for freshmen and sophomores but then differ for juniors and seniors. The freshman and sophomore courses provide the student with an understanding of the basic principles of engineering: statics, dynamics, solid mechanics, and thermodynamics. In the junior and senior years, the courses become more specialized and end with a capstone design course in which student teams develop an engineering system in response to industry-sponsored requirements. Detailed information is available online.

Aerospace

Aerospace engineering applies science and engineering principles to design, development, manufacture, and operation of aerospace systems and vehicles. Aerospace vehicles include aircraft such as low-speed propeller-powered aircraft, remotely autonomously piloted vehicles, micro air vehicles, hovercraft, and helicopters and spacecrafts such as rockets, space stations, and planetary rovers. Aerospace engineering not only involves design, development, manufacture, and operation but also considers environmental, economical, ethical, and social issues.

The undergraduate curriculum provides the student with knowledge of aerodynamics, aerospace materials, structures, propulsion, flight mechanics, and vehicle stability and control plus knowledge of selected topics in orbital mechanics, space environment, altitude determination and control, telecommunications, and space structures. The program educates students to define, formulate, and solve aerospace engineering problems, to function in multi-disciplinary teams, and to communicate effectively.

Aerospace engineering students gain experience with low-speed and high-speed wind tunnels and structural and material facilities for testing prototype models. A prominent feature of the program is the year-long senior design experience in which students choose from two possibilities:

1. Design, build, and flight-test fixed-wing wings and multi-rotor unmanned aerial vehicles
2. Design, build, and test small spacecrafts like solid rockets, CubeSats, inflatable structures and planetary rovers

The senior design teams and the departments'-based student clubs like Aerial Robotics and High-Powered Rocketry compete at regional and national competitions and have regularly placed in the top teams.

Aerospace engineering undergraduates are employed by the aerospace industries and other industries with similar technical problems. Many of our students enter graduate school after which they are employed by these same industries and by government laboratories such as NASA, NAVAIR, and the Air Force.

Mechanical

Mechanical engineering applies mechanical, thermal, and fluid principles to research, design, development, testing, manufacture, and operation of products and systems. Mechanical engineering is the broadest of the engineering programs, providing a technological foundation that serves societal needs in energy, health, safety, and all walks of life. Mechanical engineers solve problems dealing with energy and environmental systems (alternative fuels and renewable technologies), advanced materials and manufacturing (precision metrology, smart materials, and auto-adaptive materials), robotics and sensor technologies (opto-mechanical systems, MEMS, energy harvesting, human-centric and bio-inspired intelligent systems), and transportation (automotive and high speed rail).

In addition to taking strong foundational courses, mechanical engineering students gain experience in experimental laboratories for measurement and data analysis, performance evaluation of thermal systems, and testing and analysis of mechanical components. The senior design experience is a distinctive joint departmental-industry effort in which students solve industry-sponsored problems by designing, building, and testing prototype machines with the support of facilities for machining and electronics. Many of the students are involved in the department's student clubs, such as its Eco car and SAE car clubs that compete internationally and regularly place in the top 10.

Because of the discipline's wide breadth, mechanical engineering students have a wide variety of employment opportunities. Undergraduate students enter engineering fields that deal with, to varying levels, design, development, manufacturing, plant operation, testing and experimentation, consulting, sales and service. The employers come from industry, government and service organizations. Many of the undergraduate students go on to graduate school to pursue advanced degrees in engineering, science or business, as well as professional degree programs such as medicine, accounting and law.

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Y. Zhu, *Director of Research and Faculty Advancement*

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F. Gandhi, *Hassan A. Hassan Distinguished Professor*

X. Jiang, *Duncan Distinguished University Professor*

K. Peters, *Distinguished Professor*

F.-G. Yuan, *Samuel P. Langley Distinguished Professor*

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Plans

- Aerospace Engineering (BS) (https://catalog.ncsu.edu/undergraduate/engineering/mechanical-aerospace/aerospace-engineering-bs/)
- Mechanical Engineering (BS) (https://catalog.ncsu.edu/undergraduate/engineering/mechanical-aerospace/mechanical-engineering-bs/)

Honors Program in Mechanical and Aerospace Engineering

Students enter the mechanical and aerospace honors program by invitation. Students in these programs participate in special educational experiences involving deeper investigations into subjects and research projects.