Aeronautical and Astronautical Engineering

Aeronautical and astronautical engineering (AAE) focuses upon the challenges of flight. The proper aerodynamic shape, the correct engine for clean propulsion, the best materials for lightweight structures, and the safest control systems must be integrated to produce an efficient and economical flying machine. These challenges must be met across the broad spectrum of flight, from the low-speed, near-earth hovering of helicopters to the supersonic flight of our present-day aircraft, to the extreme speeds and ranges of our future aircraft and spacecraft. Our faculty bring their expertise in the varied disciplines of aerospace engineering to the classroom and laboratory and use extensive research activities to enhance their lectures.

A fascination with flight and an interest in airplanes or spacecraft is often the primary motivation for starting a career in aeronautical and astronautical engineering. By the time students graduate, they have developed a technical interest in aerodynamics, structures, dynamics, propulsion, controls, design, or systems. Students can obtain graduate degrees to develop more expertise in specific technical areas.

Pursuing Aeronautical and Astronautical Engineering at Ohio State

Students who wish to major in aeronautical and astronautical engineering should have a solid high school background in math and science. They should also have scientific curiosity and be both imaginative and analytical in their thinking.

Students may directly enroll as pre-engineering students; however, selection is competitive. Factors used to determine eligibility to directly enroll include ACT/SAT scores (emphasis on math), strong college prep curriculum (emphasis on math, science and rigorous courses), and class rank or GPA. The middle 50 percent of directly enrolled pre-majors (autumn 2014) had an ACT score range of 28–32 and 96 percent were in the top 25 percent of their high school classes. Students not eligible to directly enroll in engineering may enroll in Science, Technology and Environment Exploration (see exploration.osu.edu).

Acceptance into the major is competitive and based on the eligibility point hour ration (EPHR) in the following pre-major courses:

- Engineering 1181 and 1182
- Math 1172 and 2173
- Physics 1250 and 1251
- Chemistry 1250

Application to the major is not allowed until the semester during which the EPHR courses are to be completed. Applicants who have completed these required courses with an EPHR of 3.0 are guaranteed admission to the AAE major.

For more information, check these websites:

Department of Mechanical and Aerospace Engineering: mae.osu.edu
College of Engineering: engineering.osu.edu
Ohio State: osu.edu

Admissions: undergrad.osu.edu
Multicultural Center: multiculturalcenter.osu.edu
First Year Experience: fye.osu.edu

Program Requirements

Summary of major requirements:

- Engineering survey (1 course)
- Fundamentals of Engineering (2 courses)
- Chemistry (1 course)
- Physics (2 courses)
- Programming – MATLAB (1 course)
- Electrical Circuits and Electronic Devices (1 course)
- Mathematics (4 courses)
- AAE core (16 courses)
- Technical electives (3 courses)

Major requirements, including AAE technical electives, total 104 credit hours. With an additional required 24 credit hours of General Education, the total number of credit hours required for the degree is 128.

Program Educational Objectives

The Program Educational Objectives of aeronautical and astronautical engineering are to matriculate graduates who conduct themselves in a responsible, professional and ethical manner (citizenship), and who upon the years following graduation, are engaged in the following:

Discovery

- actively embracing leadership roles in the practice of engineering in industry and government organizations (including both traditional and emerging technical areas).
- research and development across disciplines (via graduate study or industry) to advance technology and foster innovation in order to compete successfully in the global economy.
- applying their engineering problem solving skills to less-traditional career paths (e.g., law, medicine, business, start-up ventures, public policy, etc.).

Learning

- actively participating in professional development opportunities (conferences, workshops, short courses, graduate education, etc.).
- updating and adapting their core knowledge and abilities to compete in the ever-changing global enterprise.
- developing new knowledge and skills to pursue new career opportunities.

Engagement

- serving as mentors for the engineering profession, helping others develop a passion for engineering.
- exchanging and applying knowledge to create new opportunities that advance our society and solve a variety of technical and social problems.
- entrepreneurial ventures and fostering activities that support sustainable economic development that enhance the quality of life of people in the state, across the country and around the world.
Curriculum Sample
This is a sample list of classes a student will take to pursue a degree in aeronautical and astronautical engineering (BSAAE). Since university students need more than specific education in a narrow field, they also will take classes to complete General Education (GE) requirements. Because GE courses come from a variety of academic areas of study, this course work helps students develop fundamental skills essential to collegiate success and allows them to tailor these courses toward their interests. Note: This sample represents one of several possible paths to a degree in aeronautical and astronautical engineering. Consult the departmental website, mae.osu.edu, for details.

Freshman Year:
- Engineering survey 1
- Fundamentals of Engineering 4
- Calculus and Analytic Geometry 10
- Chemistry 4
- Physics 5
- Computer programming – MATLAB 2
- GE courses 6
**Total hours** 32

Sophomore Year:
- Intro to AAE Engineering I and II 8
- Linear Algebra, ODEs and PDEs 6
- Electrical Circuits and Electronic Devices 3
- Physics 5
- Statics and Mechanics 4
- Dynamics 3
- Thermodynamics 3
- GE course 3
**Total hours** 35

Junior Year:
- Flight Vehicle Structure I and II 6
- Flight Vehicle Dynamics 3
- Aerodynamics 3
- Numerical Methods in AAE 3
- Gasdynamics 3
- Fundamentals of Flight Vehicle Control 3
- Heat Transfer 3
- GE courses 6
**Total hours** 30

Senior Year:
- Principles of Vehicle Propulsion 3
- Experimental Projects I and II 4
- Preliminary Design of Atmospheric Vehicles 3
- or Design of Space Vehicles and Systems Project Laboratory I 3
- Detailed Design of Atmospheric Vehicles 3
- or Design of Space Vehicles and Systems Project Laboratory II 3
- Technical electives 9
- GE courses 9
**Total hours** 31

Ohio State’s aeronautical and astronautical engineering program is accredited by the Engineering Accreditation Commission of ABET, abet.org.

The Student Outcomes supporting our Educational Objectives can be found at go.osu.edu/aae_outcomes.

Honors, Research and BS/MS Programs
The AAE provides high-achieving and creative students research opportunities that result in graduating with either research distinction or Honors research distinction. Eligible students work one-on-one with a faculty member to develop an individual research project, earn 3 credit hours of technical elective credit, and write an undergraduate thesis that will require an oral defense to a faculty committee. To qualify for the research distinction program, students must have an overall 3.0 GPA going into their final year of studies in the aeronautical and astronautical curriculum, and for the Honors research distinction program, at least a 3.4 overall GPA.

Students with at least a 3.5 overall GPA are also eligible for the BS/MS combined degree program. This is an efficient way to earn a master’s degree, as students have the opportunity to double-count credit from their undergraduate degree toward a graduate degree in the Department of Mechanical and Aerospace Engineering. Students in this program are normally accepted at the end of their junior year and begin taking graduate-level courses during their final year of studies. This enables most students to complete MS requirements in three semesters after completing the BS degree.

Career Prospects in Aeronautical and Astronautical Engineering
Following graduation, AAE students are typically employed in the aerospace industry, which includes large aerospace companies, general aviation manufacturing, airlines, and government aerospace laboratories or research centers. In a large aerospace company, the initial assignment will probably be with a large design team. The assignment will likely be a technical one dealing with a problem related to an airplane, missile or spacecraft being designed. As experience is gained, more complex problems and responsibilities will be assigned. Depending on interests and competence, graduates can progress through the technical part of the company or through management. Students will also gain the same type of experience if they join a general aviation company. However, the design team will not be as large and assignments will cover broader problems associated with the design of aircraft.

Students who choose to join an airline company as an engineer may work on technical problems associated with the operation and maintenance of a fleet of aircraft. In addition, graduates can participate in evaluating the needs of the airline for new airplanes as well as the different types of airplanes available that could meet these requirements.

Students who choose to join a government aerospace laboratory or research center may be assigned to a laboratory and be involved in basic research in a technical area. As graduates progress, they can become more involved in research or progress through the government and monitor technical programs that have been funded to the private sector of the aerospace industry.

Beginning salaries for graduates with a BS in aeronautical and astronautical engineering range from $56,000 to $77,000 with the average around $66,000. Salary depends on a candidate’s skills, previous work experience and other factors. For more information, visit ecs.osu.edu.

Revised July 2015. Information subject to change. For the most up-to-date information on the AAE program, visit mae.osu.edu.

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