Aerospace Engineering (BSAsE)

Objectives

Attainment of these outcomes prepares graduates to enter the professional practice of engineering. Aerospace engineering graduates should demonstrate:

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- An ability to communicate effectively with a range of audiences
- An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Total Hours Required: 127

Plan of Study

The Plan of Study is a suggested four-year course sequence to support academic planning and serves as a helpful guide. Currently enrolled students should meet with their academic advisor to tailor their course selections and timelines to their individual goals and circumstances.

Course	Title	Hours
Year 1		
Semester 1		
M 408C	Differential and Integral Calculus	4
CH 301	Principles of Chemistry I	3
RHE 306	Rhetoric and Writing	3
Social and Behavioral Sciences (080)		3
First-Year Signature Course (090)		3
	Hours	**16**
Semester 2		
M 408D	Sequences, Series, and Multivariable Calculus	4
COE 301	Introduction to Computer Programming	3
PHY 303K	Engineering Physics I	3
PHY 105M	Laboratory For Physics 302K, 303K, and 317K	1
U.S. History (060)		3
American and Texas Government (070)		3
	Hours	**17**
Year 2		
Semester 1		
M 427J	Differential Equations with Linear Algebra	4
E M 306	Statics	3
PHY 303L	Engineering Physics II	3
PHY 105N	Laboratory For Physics 302L, 303L, and 317L	1
M E 210	Engineering Design Graphics	2
M E 310T	Applied Thermodynamics	3
	Hours	**16**
Semester 2		
M 427L	Advanced Calculus for Applications II	4
COE 311K	Engineering Computation	3
E M 311M	Dynamics	3
E M 319	Mechanics of Solids	3
E S 333T	Engineering Communication	3
	Hours	**16**
Year 3		
Semester 1		
ASE 320	Low-Speed Aerodynamics	3
ASE 120K	Low-Speed Aerodynamics Laboratory	1
ASE 330M	Linear System Analysis	3
ASE 366K	Spacecraft Dynamics	3
Humanities (040)		3
Hours chosen from: Structures Elective		3
	Hours	**16**
Semester 2		
ASE 362K	Compressible Flow	3
ASE 370C	Feedback Control Systems	3
Hours chosen from: ASE elective		3
ASE 375	Electromechanical Systems	3
Hours chosen from: Technical elective		3
	Hours	**15**
Year 4		
Semester 1		
ASE 376K	Propulsion	3
ASE 367K	Flight Dynamics	3
Hours chosen from: ASE elective		3
ASE 374D	Aerospace Systems Senior Design I	3
ASE 162M or ASE 166M	High-Speed Aerodynamics Laboratory or Spacecraft Systems Laboratory	1
Visual and Performing Arts (050)		3
	Hours	**16**
Semester 2		
ASE 324L	Aerospace Materials Laboratory	3
Hours chosen from: ASE elective		3
ASE 374E	Aerospace Systems Senior Design II	3
U.S. History (060)		3
American and Texas Government (070)		3
	Hours	**15**
	Total Hours	**127**

Requirements

All requirements are listed below, starting with the most specialized moving to the most general. Additional requirements may follow the table, so be sure to read the entire page. Some required courses listed below may also satisfy General Education requirements, including Core Curriculum.

Code	Title	Hours
Concentration		
ASE 374D	Aerospace Systems Senior Design I	3
ASE 374E	Aerospace Systems Senior Design II	3
ASE 162M or ASE 166M	High-Speed Aerodynamics Laboratory Spacecraft Systems Laboratory	1
Hours chosen from: Approved Technical Elective		3
Hours chosen from: Approved Aerospace elective		9
Hours chosen from: Approved Structures elective		3
ASE 339 or E M 339	Advanced Strength of Materials Advanced Strength of Materials	

ASE 357	Mechanics of Composite Materials	
ASE 365	Structural Dynamics	
COE 321K	Computational Methods for Structural Analysis	
Subtotal		*22*
Degree (see details below)		**81**
Free electives: Additional coursework to reach total hours required.		0
Subtotal		*81*
General Education		
Remaining Core Curriculum (42 hours total)		24
Foreign Language other than English, Beginning Proficiency		
Subtotal		*24*
College Requirements - Engineering		
General University Requirements		
Total Hours		**127**

Degree-Bachelor of Science in Aerospace Engineering (BSAsE)

The field of aerospace engineering developed because of humanity's desire for aircraft systems for military, commercial, and civilian purposes; it was first called aeronautical engineering or aeronautics. When the space age began, it was natural for aeronautical engineers to participate in the development of spacecraft systems for space exploration. This branch of engineering became known as astronautical engineering or astronautics, and the combined field is called aerospace engineering or aeronautics and astronautics. Because of the diverse nature of the work, the aerospace engineer must have a basic knowledge of physics, mathematics, digital computation, and the various disciplines of aerospace engineering: aerodynamics and propulsion, structural mechanics, flight mechanics and orbital mechanics, and control. Because of their extensive education in fundamental disciplines, aerospace engineers can work in areas other than aerospace engineering and are employed in a wide range of careers.

The objectives of the aerospace engineering degree program are to prepare students for professional practice in aerospace engineering and related engineering and scientific fields; to prepare students for such postbaccalaureate study as their aptitudes and professional goals may dictate; to instill in students a commitment to lifelong education and to ethical behavior throughout their professional careers; and to make students aware of the global and societal effects of technology. To meet these objectives, the faculty has designed a rigorous curriculum that emphasizes fundamentals in the basic sciences, mathematics, and the humanities, and integrates classroom and laboratory experiences in the engineering disciplines of aerodynamics and propulsion, structural mechanics, mechanics of materials, flight and orbital mechanics, controls, computation, electromechanical systems, design, and technical communication. The curriculum requires students to use modern engineering tools, to work individually, and to practice teamwork.

The first two years of the aerospace engineering curriculum emphasize fundamental material along with engineering sciences, while the third year introduces concepts in the areas of aerodynamics and propulsion, structural mechanics, flight mechanics and orbital mechanics, and flight control. The fourth year provides further depth in aerospace engineering, with emphasis on design and laboratory courses. The degree is complemented by general education courses and courses offered in other engineering disciplines. In addition, during the junior year the student may choose electives that increase the breadth of the program or that provide additional depth within one or more subdisciplines within the department. All of the following subdisciplines are also represented in the elective options.

Aerodynamics and Propulsion

This subdiscipline involves fluid motion, propulsion, lift and drag on wings and other bodies, high-speed heating effects, and wind tunnel investigation of these problems. Topics of study include fluid mechanics, gas dynamics, heat transfer, aerodynamics, propulsion, computational fluid dynamics, and experimental fluid mechanics.

Structural Mechanics

This subdiscipline includes the study of airplane, spacecraft, and missile structures, the materials that make them efficient, and methods for testing, analysis, and design of new structural systems. Course topics include structural analysis, structural dynamics, materials (including advanced composites), aeroelasticity, experimental structural mechanics, and computer-aided design of structures.

Flight Mechanics and Orbital Mechanics

Flight mechanics involves the analysis of the motion of aircraft, missiles, rockets, reentry vehicles, and spacecraft that are subjected to gravitational, propulsive, and aerodynamic forces; the study of uncontrolled motion of satellites and coasting spacecraft is usually referred to as orbital mechanics. Subject matter in these areas includes trajectory analysis and optimization; attitude dynamics, stability, and control; flight test; orbit determination; orbital operations; systems engineering; sensors; satellite hardware applications; and simulation.

Flight Control

Control theory is applied in aerospace engineering to the development of automatic flight control systems for aircraft (autopilots and stability augmentation systems), attitude control systems for satellites, and guidance and control systems for missiles, rockets, reentry vehicles, and spacecraft. Course topics include linear system theory, classical control theory, digital control, and probability theory.

Portable Computing Devices

Students entering aerospace engineering are required to have access to a portable computing device capable of running the software tools required for undergraduate engineering analyses (MATLAB, SOLIDWORKS, Word, Excel, etc.) and accessing the remote server for the department. This device does not need to be brought to campus on a daily basis, but individual courses may require that the device be brought to certain lectures, labs, and/or exams. Minimum and recommended specifications may be found on the department website.

Design Concentration Options

The senior design sequence requires seven semester hours of courses.

Requirements

Code	Title	Hours
Aerospace Engineering Courses		
ASE 120K	Low-Speed Aerodynamics Laboratory	1
ASE 320	Low-Speed Aerodynamics	3
ASE 324L	Aerospace Materials Laboratory	3
ASE 330M	Linear System Analysis	3
ASE 362K	Compressible Flow	3
ASE 366K	Spacecraft Dynamics	3
ASE 367K	Flight Dynamics	3
ASE 370C	Feedback Control Systems	3
ASE 375	Electromechanical Systems	3
ASE 376K	Propulsion	3
Chemistry		

CH 301	Principles of Chemistry I	3
Computational Engineering		
COE 301	Introduction to Computer Programming	3
COE 311K	Engineering Computation	3
Engineering Mechanics		
E M 306	Statics	3
E M 311M	Dynamics	3
E M 319	Mechanics of Solids	3
Mathematics		
M 408C	Differential and Integral Calculus	4
M 408D	Sequences, Series, and Multivariable Calculus	4
M 427J	Differential Equations with Linear Algebra	4
M 427L	Advanced Calculus for Applications II	4
Physics		
PHY 105M	Laboratory For Physics 302K, 303K, and 317K	1
PHY 105N	Laboratory For Physics 302L, 303L, and 317L	1
PHY 303K	Engineering Physics I	3
PHY 303L	Engineering Physics II	3
Rhetoric and Writing		
RHE 306	Rhetoric and Writing	3
Other Required Courses		
M E 210	Engineering Design Graphics	2
M E 310T	Applied Thermodynamics	3
E S 333T	Engineering Communication	3
Total Hours		**81**

Additional Requirements and Policies

- Students must take all courses required for the degree on the letter-grade basis and must earn a grade of at least *C-* in each course, except for those listed as Remaining Core Curriculum courses.
- Students must also maintain grade point averages of at least 2.00 in the major area of study and in required technical courses as described in Academic Standards, and a cumulative University grade point average of at least 2.00 as described in the General Information Catalog.
- Courses used to fulfill technical elective requirements must be approved by the aerospace engineering faculty before the student enrolls in them.

Special Projects Laboratories

The department offers students the opportunity to participate in special projects such as student-built radio-controlled aircraft competitions and student satellite-building projects. These time-intensive projects are open to all aerospace engineering students with at least 15 semester hours of University credit toward the degree and a grade point average of at least 2.50. Academic credit for participation in departmentally approved student projects is available on the pass/fail basis through the course ASE 128. Three such laboratory courses can be combined to count as one three-hour technical elective; one such laboratory course can be combined with a two-hour cooperative program to count as one three-hour technical elective.