**Requirements for the Bachelor of Science in Aerospace Engineering**

Accredited by the Engineering Accreditation Commission of ABET, [http://www.abet.org](http://www.abet.org)

**College of Engineering**

The University of Oklahoma

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### General Requirements

<table>
<thead>
<tr>
<th>Total Credit Hours</th>
<th>128*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Retention/Graduation Grade Point Averages:</td>
<td></td>
</tr>
<tr>
<td>Overall - Combined and OU</td>
<td>2.00</td>
</tr>
<tr>
<td>Major - Combined and OU</td>
<td>2.00</td>
</tr>
<tr>
<td>Curriculum - Combined and OU</td>
<td>2.00</td>
</tr>
</tbody>
</table>

A minimum grade of C is required for each course in the curriculum.

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**OU encourages students to complete at least 32 hours of applicable coursework each year to have the opportunity to graduate in four years.**

<table>
<thead>
<tr>
<th>Year</th>
<th>First Semester</th>
<th>Hours</th>
<th>Second Semester</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Freshman</strong></td>
<td><strong>AME</strong></td>
<td>1113, Prin. of English Composition (Core I)</td>
<td>3</td>
<td><strong>AME</strong></td>
</tr>
<tr>
<td></td>
<td><strong>CHEM</strong></td>
<td>1315, General Chemistry (Core II)</td>
<td>5</td>
<td><strong>MATH</strong></td>
</tr>
<tr>
<td></td>
<td><strong>MATH</strong></td>
<td>1823, Calculus &amp; Analytic Geometry I (Core I)</td>
<td>3</td>
<td><strong>PHYS</strong></td>
</tr>
<tr>
<td></td>
<td><strong>HIST</strong></td>
<td>1483, U.S. 1492-1865, or 1493, U.S. 1865-Present (Core IV)</td>
<td>3</td>
<td><strong>ENG</strong></td>
</tr>
<tr>
<td></td>
<td><strong>ENG</strong></td>
<td>1112, Freshman Engineering Experience</td>
<td>1</td>
<td><strong>CS</strong></td>
</tr>
<tr>
<td></td>
<td><strong>THED</strong></td>
<td>2223, Intro. to Aerospace Engineering</td>
<td>3</td>
<td><strong>ENGL</strong></td>
</tr>
</tbody>
</table>

**Total Credit Hours** 18

**Total Credit Hours** 16

*In order to be admitted to upper-division AME classes, students must submit an application to the AME office. At the time of the application, students shall have completed a set of requisite courses and should have a 2.80 OU retention and 2.80 combined retention grade point average.*

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**Sophomore**

| **AME** | 2233, Calculus & Analytic Geometry III | 3 |
| **PHYS** | 2524, General Physics for Engineering & Science Majors | 4 |
| **AME** | 2113, Statics | 3 |
| **AME** | 2213, Thermodynamics | 3 |
| **AME** | 2223, Intro. to Aerospace Engineering | 3 |

**Total Credit Hours** 16

**Total Credit Hours** 16

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**Junior**

| **AME** | 3112, Solid Mechanics Lab | 2 |
| **AME** | 3143, Solid Mechanics | 3 |
| **AME** | 3253, Aerodynamics | 3 |
| **AME** | 3272, Wind Tunnel Lab | 2 |
| **AME** | 4383, Control Systems | 3 |
| **ENGR** | 2002, Professional Development | 2 |

**Total Credit Hours** 15

**Total Credit Hours** 17

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**Senior**

| **AME** | 4243, Aerospace Propulsion Systems | 3 |
| **AME** | 4273, Aerospace Systems Design I | 3 |
| **AME** | 4493, Space Sciences and Astrodynamics | 3 |
| **AME** | 4513, Flight Controls | 3 |
| **#AME** | Approved Technical Elective | 3 |

**Total Credit Hours** 15

**Total Credit Hours** 15

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**Note:** Engineering transfer students may take ENGR 3511 in place of ENGR 1411.

Courses designated as Core I, II, III, IV or Capstone are part of the General Education curriculum. Students must complete a minimum of 40 hours of General Education courses, chosen from the approved list.

† To be chosen from the University-Wide General Education Approved Course List. Three of these 12 hours must be upper-division (3000-4000). See list online.

In the College of Engineering, in order to progress in your curriculum, and as a specific graduation requirement, a grade of C or better is required in each course in the curriculum. Please refer to the General Catalog for additional enrollment limitations.

Students must successfully complete prerequisite courses (with a minimum C grade) before proceeding to the next course.

* Two college-level courses in a single foreign language are required; this may be satisfied by successful completion of 2 years in a single foreign language in high school.

Students who must take foreign language at the University will have an additional 6-10 hours of coursework.

§ It is recommended that a student take either AME 4802 “Robotics Laboratory” or 4812 “Dynamics and Controls Laboratory” for the experimental elective.

A list of technical electives is available in the AME Office, Felgar Hall 212.

‡ AME courses are sequential and usually offered only in the semester shown. Note prerequisites on the back of this page.

*This course fulfills the Computer Literacy Requirement for graduation as required by the Oklahoma State Regents for Higher Education. If CS 1323 is taken, students must have a working knowledge of C language before enrolling in AME 3623.
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COURSES IN AEROSPACE AND MECHANICAL ENGINEERING (AME)

2113 Statics. Prerequisite: Physics 2514 and Mathematics 2433 or concurrent enrollment in Mathematics 2433. Vector representation of forces and moments: general three-dimensional theorems of statics; centroids and moments of area and inertia. Free-body diagrams, equilibrium of particles and rigid bodies, distributed loads, friction and internal shear and moment loads. Analysis of trusses, frames, and machines. (F)

2213 Thermodynamics. Prerequisite: Mathematics 2433 and Physics 2524, or concurrent enrollment (in both). First and second law of thermodynamics are developed and applied to the solutions of problems from a variety of engineering fields. Extensive use is made of differential calculus. (F, Sp, Su) [I-M]

2223 Introduction to Aerospace Engineering. Prerequisite: Physics 2514. Nature of atmospheric and space flight and of associated vehicles, conceptual design of flight and space vehicles, and current problems in aerospace engineering. (F, Sp)

2303 Maier and Cattafesta. Manufacturing Processes (Crosslisted with Industrial Engineering 2303). Prerequisite: 2113 or Civil Engineering 2113 or Engineering 2111. Mechanical and physical properties of engineering materials. Introduction to design concepts, manufacturing processes and equipment used in engineering. (Sp)

2533 Dynamics. Prerequisite: 2113, Mathematics 2433. Dynamics (kinematics and kinetics of particles and rigid bodies for rectilinear, curvilinear and angular motion; work and energy; conservation of impulse and momentum; introduction to mechanical vibrations. (Sp)

2623 Circuits and Sensors. Prerequisite: Mathematics 3413 and 3401, or concurrent enrollment; Physics 2524 or concurrent enrollment. Formulation and solution of circuit equations, network theorems, sinusoidal steady-state analysis, simple transients. Introduction to digital logic circuits. Physical principles of sensing and actuation. Applications to engineered systems of computer programming, embedded systems, and controls. (F, Sp, Su) [II-NL]

3103 Interdisciplinary Graphics. Prerequisite: Mathematics 1823. Visualization and modeling techniques for product design and development. Design methodology, graphic standards, projection theory, freehand sketching, spatial geometry, CAD systems, geometric modeling, and tolerancing. Solving open-ended design and visualization problems. Laboratory (F)

3112 Solid Mechanics Lab. Prerequisite: 2113 or Engineering 2113; 3143 or concurrent enrollment. Measurement of displacement; velocity, acceleration, force, torque, strain, stress, data acquisition and processing; data analysis. Laboratory (F)

3143 Solid Mechanics. Prerequisite: 2113 or Engineering 2113, Mathematics 3113, or 3413 and 3401. Concepts of stress and strain; mechanical behavior of engineering materials; analysis of uniform stress states; analysis of members in tension; stresses and deflections in beams; moments and theories of failure; design criteria. (F)

3173 Heat Transfer. Prerequisite: 2213 or Engineering 2213, and 3153. Heat transfer by conduction, convection, and radiation; mass transfer and combined modes of heat transfer. (Sp)

3223 Aerodynamics. Prerequisite: 2223, 2533, Mathematics 3413 and 3401. Fluid properties, fluid statics, fluid flow description, conservation equations; incompressible inviscid flow dynamics; characteristic airflow parameters; two-dimensional flow around thin airfoils; flow around wings of finite span; boundary layer development; compressibility; governing equations for inviscid compressible flow normal and oblique shock relations; Prandtl-Meyer expansion waves; quasi-one dimensional flow through nozzles and diffusers. (F)

3272 Windtunnel Laboratory. Prerequisite: 3253 or concurrent enrollment. Operation and calibration of subsonic and supersonic wind tunnels, power and measurement. Experimental testing of model airplanes and aerodynamic shapes, determination of drag of flight vehicle components. Lecture and Laboratory (F)

3333 Flight Mechanics. Prerequisite: 2223, 2533. Performance of aerospace vehicles, weight and balance, equations of motion for rigid aircraft, introduction to static stability and control (open-loop) and handling qualities (closed-loop) analysis. (F)

3523 Aerospace Structural Analysis. Prerequisite: 3143, Mathematics 3413 and 3401. Advanced concepts of stress and strain; introduction to the analysis of aerospace engineering structures: complex bending and torsion, shear flows in thin-walled and stringer-skinned sections; buckling; introduction to the finite element method; introduction to composite materials. (F)

3623 Embedded Real-Time Systems. Prerequisite: 2623 or equivalent, Computer Science 1313 or 1323 or equivalent. The fundamentals of real-time embedded systems are covered including processes, scheduling, frequency requirements, and watchdog timers. Includes work with actual real-time systems. (Sp)

G4243 Aerospace Propulsion Systems. Prerequisite: 2213 or Engineering 2213, and 3253. Propulsion systems, review of compressible flow, combustion and thermochanical analysis, reciprocating engines, gas turbine and jet engines, current developments in propulsion systems. (F)

4273 Aerospace Systems Design I (Slashed with 5273). Prerequisite: 3253 and 3333, or permission of instructor. Analysis and design of an aerospace system such as a complete flight vehicle, a propulsion system, a structural system, or a control system; market analysis, operating studies, mission specification, certification requirements; configuration selection; multidisciplinary behavior of design, classical design and analysis methods. No student may earn credit for both 4273 and 5273. Laboratory (F)

4373 Aerospace Systems Design II (Slashed with 5373). Prerequisite: 4273 or permission of instructor. Analysis and design of an aerospace systems such as a complete flight vehicle, a propulsion system, a structural system, or a control system; handling qualities, human factors, propulsion system integration design case studies; consideration of operational aspects, reliability, and maintainability; ground and flight testing; advanced design and analysis methods. No student may earn credit for both 4373 and 5373. Laboratory (Sp) [V]

4G383 Control Systems Design I (Slashed with 5433 and 5438). Prerequisite: 4273 or permission of instructor. An introduction to the concepts and theory of feedback control systems. Representation of electromechanical systems and aerospace vehicles by transfer and state variable methods. Stability and performance analysis, design techniques and synthesis methods for linear control systems. (F)

4G513 Flight Controls (Slashed with 5513). Prerequisite: 3333, 4383. Classical control theory with applications to aircraft flight control system design. No student may earn credit for both 4G513 and 5513. (F)

4G539 Space Systems and Mission Design (Slashed with 5539). Prerequisite: 4493 or permission from instructor. Topics include basic orbital mechanics, orbit determination, propulsion and related numerical techniques, interplanetary transfer, influence of space environment, atmospheric re-entry. Space vehicles subsystems design; propulsion, attitude determination and control, structural design, thermal control, power and telecommunications. Investigation into mission design concepts and consideration. No student may earn credit for both 4G539 and 5539. (Sp)

COURSES IN ANTHROPOLOGY (ANTH)

4623 Approaches to Cross-Cultural Human Problems. Prerequisite: 1113 or junior standing. Introduces students to the complex problems of contemporary global-scale cultures and helps them place their role on this global arena. This course will look at specific international issues or problems, and relate them to processes occurring in many parts of the world. (Ireg) [IV-NW]

COURSES IN CHEMISTRY AND BIOCHEMISTRY (CHEM)

1315 General Chemistry. Prerequisite: Mathematics 1503 or 1643, or math ACT equal to or greater than 23. First of a two-semester sequence in general chemistry. Topics covered: basic measurement, gas laws and changes in state, stoichiometry, atomic theory, electron configuration, periodicity, bonding, molecular structure and thermochromy. Laboratory (F, Sp, Su) [II-LAB]

COURSES IN COMMUNICATION (COMM)

3513 Intercultural Communication. Prerequisite: 1113 or junior standing. Introduction to conceptualization and application of communication theory, research and selected applications. Topics include conceptualizing intercultural communication theoretically, trends in diffusion of innovation, nationality barriers and training for foreign assignments. (F, Sp, Su) [IV-WC]

COURSES IN COMPUTER SCIENCE (C S)

3133 Programming for Nonmajors. Prerequisite: 1523 or concurrent enrollment. Introduction to the design and implementation of computer programs. Emphasis on problem solving. (F, Sp)

COURSES IN ENGINEERING (ENGR)

1411 Freshman Engineering Experience. Prerequisite: declared major in Engineering or permission of instructor. Required of all entering freshmen with a declared Engineering major. Lecture hours cover a variety of topics including: majors and minors; career planning; advising; and extra-curricular activities. Students also work on multi-disciplinary engineering projects in smaller teams. Laboratory (F, Sp, Su) [II-LAB]

2002 Professional Development. Prerequisite: sophomore standing. Develop an understanding of engineering ethics, teamwork, leadership, and professional responsibility through the concepts of contemporary, social, and global issues. (F, Sp)

COURSES IN MATHEMATICS (MATH)

1823 Calculus and Analytic Geometry I. Prerequisite: 1523 or OU, or satisfactory score on the placement test, or, for incoming freshmen direct from high school, satisfactory score on the ACT/SAT. Topics covered include equations of straight lines, conic sections, functions, limits and continuity; differentiation; maximum-minimum theory and curve sketching. A student may not receive credit for this course and 1743. (F, Sp, Su) [I-M]

2423 Calculus and Analytic Geometry II. Prerequisite: 1823. Integration and its applications; the calculus of transcendental functions; techniques of integration; and the introduction to differential equations. A student may not receive credit for this course and 2123. (F, Sp, Su) [I-M]

2433 Calculus and Analytic Geometry III. Prerequisite: 2423. Polar coordinates, parametric equations, sequences, infinite series, vector analysis. (F, Sp, Su)

2443 Calculus and Analytic Geometry IV. Prerequisite: 2433. Vector calculus; functions of several variables; partial derivatives; gradients, extreme values and differentials of multivariate functions; multiple integrals; line and surface integrals. (F, Sp, Su)


G4313 Physical Mathematics I. Prerequisite: 2443 or 2934 or concurrent enrollment. Complex numbers and functions. Fourier series, solution methods for ordinary differential equations and partial differential equations, Laplace transforms, series solutions, Legendre’s equation. Duplicates two hours of 3113. (F)

COURSES IN PHYSICS (PHYS)

2514 General Physics for Engineering and Science Majors. Prerequisite: Mathematics 1823 or Mathematics 1914 with grade of C or better. Not open to students with credit in 2125. Vectors, kinematics and dynamics of particles, work and energy systems of particles, rotational kinematics and dynamics, oscillations, gravitation, fluid mechanics, waves. (F, Sp, Su) [II-NL]

2524 General Physics for Engineering and Science Majors. Prerequisite: 2514 and Mathematics 2423. Not open to students with credit in 2125. Temperature, heat, thermodynamics, electricity, magnetism, optics. (F, Sp, Su)