# REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN AEROSPACE ENGINEERING/MASTER OF SCIENCE

**THE UNIVERSITY OF OKLAHOMA**

**Aerospace Engineering**

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

**GALLOGLY COLLEGE OF ENGINEERING**

**FOR STUDENTS ENTERING THE OKLAHOMA STATE SYSTEM FOR HIGHER EDUCATION SUMMER 2018 THROUGH SPRING 2019**

## GENERAL REQUIREMENTS

**Total Credit Hours** ............................................. 152-158+

**Minimum Retention/Graduation Grade Point Averages:**
- Overall - Combined and OU ....................................... 3.25
- Major - Combined and OU ........................................... 3.25
- Curriculum - Combined and OU .................................... 3.25

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

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### OU encourages students to complete at least 31-32 hours of applicable coursework each year to have the opportunity to graduate in five years.

**Year** | **FIRST SEMESTER** | **Hours** | **SECOND SEMESTER** | **Hours**
---|---|---|---|---
**FRESHMAN** | **ENGL 1113, Prin. of English Composition (Core I)** | 3 | **ENGL 1213, Prin. of English Composition (Core I), or** | 3
|  | **CHEM 1315, General Chemistry (Core II)** | 5 | **EXP 2123, Expository Writing (Core I)** | 4
|  | **MATH 1914, Differential and Integral Calculus I (Core I)** | 4 | **MATH 2924, Differential and Integral Calculus II** | 3
|  | **HIST 1483, U.S. 1492-1865, or** | 3 | **PHYS 2514, General Physics for Engineering & Science Majors (Core II)** | 4
|  | **ENGR 1411, Freshman Engineering Experience** | 1 | **P SC 1113, American Federal Government (Core III)** | 3
|  |  |  | **CS 1313, Programming for Non-Majors with C** | 3
|  |  |  |  | 2

**TOTAL CREDIT HOURS** | 16 | **TOTAL CREDIT HOURS** | 17

† In order to progress into 2nd year courses in AME, students must successfully complete (grade C or better) MATH 1914; MATH 2924; PHYS 2514 and CHEM 1315 with 3.0 Combined Retention GPA, and possess a minimum 3.0 Combined Retention GPA in 24 or more credit hours.

### SECOND SEMESTER

**Sophomore**

| **ME** 2113, Statics | 3 | **AME 2213, Thermodynamics** | 3
|  |  | **†AME 2223, Intro. to Aerospace Engineering** | 3
|  |  |  | **†Approved Elective: Artistic Forms (Core IV)** | 3

**TOTAL CREDIT HOURS** | 17 | **TOTAL CREDIT HOURS** | 16

**Junior**

| **AME 3112, Solid Mechanics Lab** | 2 | **AME 3103, Interactive Engineering Design Simulation** | 3
|  | **AME 3143, Solid Mechanics** | 3 | **AME 3333, Flight Mechanics** | 3
|  | **AME 3253, Aerodynamics** | 3 | **AME 3523, Aerospace Structural Analysis** | 3
|  | **AME 3272, Wind Tunnel Lab** | 2 | **AME 3623, Embedded Real-Time Systems** | 3
|  | **AME 4383, Control Systems** | 3 | **ENGL 3153, Technical Writing** | 3
|  | **ENGR 2002, Professional Development** | 2 |  | 2

**TOTAL CREDIT HOURS** | 15 | **TOTAL CREDIT HOURS** | 17

**Senior**

| **AME 4243, Aerospace Propulsion Systems** | 3 | **AME 4373, Aerospace Systems Design II (Capstone)** | 3
|  | **AME 4273, Aerospace Systems Design I** | 3 | **COMM 3513, Intercultural Communication (or an advisor-approved substitution) Western Civ. & Culture (Core IV)** | 3
|  | **AME 5493, Space Sciences and Astrodynamics** | 3 | **TANTH 4623, Approaches to Cross-Cultural Human Problems (or an advisor-approved substitution) Non-Western Culture (Core IV)** | 3
|  | **AME 4513, Flight Controls** | 3 | **† Approved Elective: Social Science (Core III)** | 3
|  | **AME Graduate Elective** | 3 | **AME Graduate Elective** | 3

**TOTAL CREDIT HOURS** | 15 | **TOTAL CREDIT HOURS** | 15

**Fifth Year**

| **AME 5573, Adv. Engineering Analysis I, or MATH Elective** | 3 | **SAME 5980, Thesis Research or Graduate-level Elective** | 3-4
|  | **$AME 5980, Thesis Research or Graduate-level Elective (2000-4000)** | 2-3 | **SAME Graduate Elective** | 3
|  | **AME Graduate Elective** | 3 | **AME Graduate Elective** | 3
|  | **AME Graduate Elective** | 3 |  | 3

**TOTAL CREDIT HOURS** | 11-12 | **TOTAL CREDIT HOURS** | 12-13

† Students may enter the accelerated program based on the undergraduate degree pattern offered in the year they first enrolled in the Oklahoma State System of Higher Education or later.

**Fifth Year:** A student must successfully complete prerequisite courses (with a minimum C grade) before proceeding to the next course.

**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.

**‡ 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.

**§ 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.

**Kansas State University-Wide General Education Approved Course List.** Three of these 12 hours must be upper-division (3000-4000). See list online.

**∥ 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.

**¶ 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.

**∑ 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.

**Aerospace Engineering**

**A010 Bachelor of Science in Aerospace Engineering/Master of Science (Aerospace Engineering) F010**

Students are eligible for graduate status upon graduation with the Bachelor of Science in Aerospace Engineering.

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

**Fourth and fifth year graduate electives must satisfy MS in aerospace engineering requirements.**

**AP credit is acceptable for any of these required courses.**

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.

**†CHEM 1315 may be substituted with CHEM 1335 (Fall only).**

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

‡AP credit is acceptable for any of these required courses.

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

†‡MATH 1823, 2423, 2433, and 2434 sequence can be substituted for MATH 1914, 2924, and 2934.

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.

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.

Fourth and fifth year graduate electives must satisfy MS in aerospace engineering requirements.

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.

**†CHEM 1315 may be substituted with CHEM 1335 (Fall only).**

†AP credit is acceptable for any of these required courses.

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

†‡MATH 1823, 2423, 2433, and 2434 sequence can be substituted for MATH 1914, 2924, and 2934.

**First and second year courses in AME are taken for undergraduate credit. Students must successfully complete prerequisite courses (with a minimum C grade) before proceeding to the next course.**

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.
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COURSES IN AEROSPACE AND MECHANICAL ENGINEERING (AME)

2113 Statics. Prerequisite: Physics 2514; MATH 1823 or 1914; MATH 2423 or 2924; and CHEM 1315 with a minimum grade of C or better with an overall average of 3.0 in these four courses. (AP credit accepted and weighted based upon score.) Materials 2433 or 2934 or concurrent enrollment in Mathematics 2433 or 2934. Representation of forces and moments; general three-dimensional theorems of statics; centroids and moments of area and inertia. Free body diagrams of a particle and rigid bodies with distributed loads, friction and internal shear and moment loads. Analysis of trusses, frames, and machines. (F)

2213 Thermodynamics. Prerequisite: Physics 2514; MATH 1823 or 1914; MATH 2423 or 2924; and CHEM 1315 all with a minimum grade of C or better with an overall average of 3.0 in these four courses. (AP credit accepted and weighted based upon score.) Introduction to the foundational dynamics of aerospace vehicles, propulsion system performance, and basic aerodynamic forces and coefficients. (Sp)

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

2523 Aerospace Propulsion Systems. Prerequisite: Aerospace Engineering 2113 or 2533. An introduction to propulsion systems, with a focus on aerospace engineering. Topics include propulsion system design, analysis, and testing. (F, Sp, Su) [II-NL]

2223 Introduction to Aerospace Engineering. Prerequisite: PHYS 2514; MATH 1823 or 1914; MATH 2423 or 2924; and CHEM 1315 all with a minimum grade of C or better with an overall average of 3.0 in these four courses. (AP credit accepted and weighted based upon score.) Introduction to the foundational dynamics of aerospace vehicles, propulsion system performance, and basic aerodynamic forces and coefficients. (F)

2623 Circuits and Sensors. Prerequisite: Physics 2514; MATH 1823 or 1914; MATH 2423 or 2924; and CHEM 1315 all with a minimum grade of C or better with an overall average of 3.0 in these four courses. (AP credit accepted and weighted based upon score.) Materials 2433 or 2934 or concurrent enrollment in Physics 2524 or concurrent enrollment. Formulation and solution of circuit equations, Kirchhoff’s circuit 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. (Sp)

3103 Interactive Engineering Design Simulation. Prerequisite: AME 3143, Solid Mechanics; and AME 3153, Fluid Mechanics or AME 3253, Aerodynamics. Visualization and introductory finite element modeling techniques for product design and development. Three-dimensional CAD modeling, components and assemblies, graphic standards, dimensions and tolerances, engineering drawings. Introduction to the finite element methods for structural and fluid mechanics problems, with verification. (Sp)

3112 Solid Mechanics Lab. Prerequisite: 2113 or Engineering 2113; 3134 or concurrent enrollment. Measurement of displacement; velocity, acceleration, force, torque, strain, stress, data acquisition and analysis; data analysis software. (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 torsion; stresses and deflections in beams; modes and theories of failure; design criteria. (F)

3253 Aerodynamics. Prerequisite: 2223, 2533. Mathematics 3413 and 3401. Fluid properties, fluid statics, flow description, conservation equation; incompressible inviscid flow dynamics; characteristic airfoil parameters; two-dimensional flow around thin airfoils; flow around wings of finite span; boundary layer development; compressibility; governing equations for compressible flow; Prandtl-Meyer expansion waves; quasi-one-dimensional flow through nozzles and diffusers. (F)

3272 Windtunnel Laboratory. Prerequisite: AME 3253 or concurrent enrollment. Operation and calibration of a subsonic wind tunnel. Experimental testing of airfoils, model airplanes, and aerofoil theory. (F, Sp)

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

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. (F)

G4243 Aerospace Propulsion Systems. Prerequisite: AME 2213 and AME 3253. Propulsion systems, review of compressible flow, combustion and thermochemical analysis, gas turbine and jet engines, rocket vehicles, chemical rockets. This course is approved for graduate credit. (F)

G4273 Aerospace Systems Design I (Slashed with 5273). Prerequisite: AME 3103, AME 2533, AME 3333, and AME 3523 or permission of the instructor. Analysis, design, and optimization of an aerospace system. Performance analysis, mission simulation, and multidisciplinary optimization of aerospace vehicles using both classical and modern design and analysis methods. No student may earn credit for both 4273 and 5273. (Laboratory) (F)

G4373 Aerospace Systems Design II (Slashed with 5373). Prerequisite: AME 4273 or permission of the instructor. Synthesis course that enulates a team aerospace design program from concept design to final design; emphasis on using interdisciplinary design methods and integrative analysis, detailed CAD, FEA, and CFD analysis; optimization of aircraft configuration. Advanced design, analysis, and fabrication methods based on a complete flight vehicle, a propulsion system, a structural system, or a control system. Laboratory. No student may earn credit for both 4373 and 5373. (Sp) [V]