

REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

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GALLOGLY COLLEGE OF ENGINEERING

THE UNIVERSITY OF OKLAHOMA

GENERAL REQUIREMENTS

Total Credit Hours 133•
Minimum Retention/Graduation Grade Point Averages:
 Overall - Combined and OU 2.00
 Major - Combined and OU 2.00
 Curriculum - Combined and OU 2.00
A minimum grade of C is required for each course in the curriculum.

Mechanical Engineering
 # (Premedical Option)
B676

Bachelor of Science
 in Mechanical Engineering

For Students Entering the
 Oklahoma State System
 for Higher Education
**Summer 2018 through
 Spring 2019**

OU encourages students to complete at least 33 hours of applicable coursework each year to have the opportunity to graduate in four 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	EXPO 1213, Expository Writing (Core I)	5
	♦MATH 1914, Differential and Integral Calculus I (Core I)	4	*#CHEM 1415, General Chemistry	5
	ENGR 1411, Freshman Engineering Experience	1	♦MATH 2924, Differential and Integral Calculus II	4
	HIST 1483, U.S., 1492-1865, or 1493, U.S., 1865-Present (Core IV)	3	PHYS 2514, General Physics for Engr. & Science Majors (Core II)	4
	TOTAL CREDIT HOURS	16	TOTAL CREDIT HOURS	16
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.				
SOPHOMORE	♦MATH 2934, Differential and Integral Calculus III	4	MATH 3113, Introduction to Ordinary Differential Equations	3
	PHYS 2524, General Physics for Engineering & Science Majors (Core II)	4	AME 2303, Materials, Design & Manufacturing Processes	3
	#CHEM 3053, Organic Chemistry	3	AME 2533, Dynamics	3
	†AME 2113, Statics	3	ENGR 2431, Electrical Circuits	1
	AME 2213, Thermodynamics	3	ENGR 2531, Electrical Circuits II	1
	AME 2402, Engineering Computing	2	ENGR 3431, Electromechanical Systems	1
			CHEM 3153, Organic Chemistry	3
			CHEM 3152, Organic Chemistry Lab	2
	TOTAL CREDIT HOURS	19	TOTAL CREDIT HOURS	17
JUNIOR	#BIOL 1114, Intro. Zoology	4	##BIOL Elective	3
	#BIOL 1121, Intro. Zoology Lab	1	AME 3103, Interactive Engineering Design Simulation	3
	AME 3112, Solid Mechanics Lab	2	AME 3122, Heat Transfer & Fluid Mechanics Lab	2
	AME 3143, Solid Mechanics	3	AME 3173, Heat Transfer	3
	AME 3153, Fluid Mechanics	3	AME 3353, Design of Mechanical Components	3
	AME 3723, Numerical Methods for Engr. Computation	3	ENGL 3153, Technical Writing	3
	ENGR 2002, Professional Development	2		
	TOTAL CREDIT HOURS	18	TOTAL CREDIT HOURS	17
SENIOR	PHYS 3223, Modern Physics for Engineers	3	AME 4553, Design Practicum (Capstone)	3
	P SC 1113, American Federal Government (Core III)	3	†COMM 3513, Intercultural Communication (or an advisor-approved substitution) Western Civ. & Culture (Core IV)	3
	AME 3363, Design of Thermal-Fluid Systems	3	†ANTH 4623, Approaches to Cross-Cultural Human Problems (or an advisor-approved substitution) Non-Western Culture (Core IV)	3
	AME 4163, Principles of Engr. Design	3	♦Approved Engineering Science Elective	3
	†Approved Elective: Social Science (Core III)	3	†Approved Elective: Artistic Forms (Core IV)	3
	TOTAL CREDIT HOURS	15	TOTAL CREDIT HOURS	15

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.

*CHEM 1315 and CHEM 1415 can be substituted with CHEM 1335 (Fall only) and 1435 (Spring only), respectively.

†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 in the Class Schedule.

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 and Advising Center Bulletin Board 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.

♦A list of Engineering Science electives is available in the AME Office, FH 212.

‡To be chosen from: BIOL 3113, 3333, or 4843.

#Pre-med students are required to consult the OU Pre-Med Adviser, Cate 1, Room 416, or call (405) 325-2457, and their Mechanical Engineering adviser each semester prior to enrolling. **NOTE:** Most medical schools also require PHYS 1311 and 1321.

Students who wish to take the MCAT in their junior year are encouraged to take the required biology elective and the organic chemistry during their junior year. Some may also wish to take an additional biology elective (not required in the curriculum).

†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 2443 sequence can be substituted for MATH 1914, 2924, and 2934.

COURSES IN AEROSPACE AND MECHANICAL ENGINEERING (AME)

2113 Statics. 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.) Mathematics 2433 or 2934 or concurrent enrollment in Mathematics 2433 or 2934. Vector representation of forces and moments; general three-dimensional theorems of statics; centroids and moments of area and inertia. Free-body diagrams, equilibrium of a particle and of rigid bodies, 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.) Mathematics 2433 or 2934; and Physics 2524, or concurrent enrollment in MATH 2433 or 2934 and PHYS 2524. 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 to interrelate thermodynamics functions. (F)

2303 Materials, Design and Manufacturing Processes (Crosslisted with ISE 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)

2402 Engineering Computing. Prerequisite: Mathematics 1823 or 1914 or concurrent enrollment. Introduction to computer programming and university computing facilities. Program design and development: computer application exercises in engineering. (F)

2533 Dynamics. Prerequisite: AME 2113, MATH 2433 or 2934. Dynamics (kinematics and kinetics) of particles and rigid bodies for rectilinear, curvilinear and angular motion; work and energy methods; conservations of impulse and momentum; introduction to mechanical vibrations. (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 finite element methods for structural and fluid mechanics problems, with verification. (Sp)

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)

3122 Heat Transfer and Fluid Mechanics Lab. Prerequisite: 2113 or Engineering 2113, 3173 or concurrent enrollment. Basic measurement concepts in fluid mechanics and thermal science. Concepts and methods of measuring pressure, temperature, flow, thermal and transport properties. Data acquisition and analysis. **Laboratory** (Sp)

3143 Solid Mechanics. Prerequisite: AME 2113 or ENGR 2113; MATH 3113, or MATH 3413 and MATH 3401; AME 2303; AME 2533. 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)

3153 Fluid Mechanics. Prerequisite: AME 2113, AME 2213, AME 2533, and MATH 3113; majors only. Principles of fluid mechanics: fluid statics, flow descriptions, conservation equations, dimensional analysis, potential flow, viscous flow and internal flow. (F)

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

3353 Design of Mechanical Components. Prerequisite: 2303 and 3143. Analysis and design of mechanical subsystems and selection of elements such as gears, shafts, clutches, brakes and modern mechanical components. (Sp)

3363 Design of Thermal-Fluid Systems. Prerequisites: AME 2402 or C S 1313 or C S 1323, AME 3153 or AME 3253, and AME 3173. Design of fluid flow, heat transfer and energy systems including analysis, synthesis and optimization. Topics include but are not limited to: ducts and piping systems, fluid machinery, heat exchangers, thermal storage devices, furnaces, combustors, refrigeration and air conditioning systems. (F)

†G3723 AME Numerical Methods For Engineering Computation. Prerequisites: AME 2402 or CH E 2002 or ENGR 2003 or C S 1313 or C S 1323, and MATH 3113 or MATH 3413. Course uses specific software applications tailored toward aerospace and mechanical engineering. Basic methods for obtaining numerical solutions with a digital computer. Included are methods for the solutions of algebraic and transcendental equations, simultaneous linear equations, ordinary and partial differential equations, and curve fitting techniques. The methods are compared with respect to computational efficiency and accuracy. Any student who earns credit for AME 3723 cannot receive duplicate credit for C S 3723, CH E 3723, or P E 3723. This course may not be taken for graduate credit within the College of Engineering. (F)

4163 Principles of Engineering Design. Prerequisites: AME 3103, AME 2533, AME 3353. Design process and methodology from concept through analysis, layout and prototyping. Types of design problems, human element in design, computer aid in design, specification development, concept generation, concept evaluation, product generation, function and performance evaluation, prototyping, design for manufacturing, design for assembly, design for life-cycle, sustainability, final product documentation, inclusive intergroup communication, ethics, safety and economics. (F)

4553 Design Practicum. Prerequisite: senior standing, 3363 and 4163. Design study of actual problems in industry. **Lecture and Laboratory** (Sp) [V]

G4653 Air Conditioning Systems. Prerequisite: 3173. Theory and design of systems for controlling properties such as temperature, humidity, air purity, air distribution and noise in enclosures. (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 better understand their place 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. (Irreg.) [IV-NW]

COURSES IN BIOLOGY (BIOL)

1114 Introductory Zoology. Major biological principles and concepts as illustrated in the structure, function and evolution of animals. Emphasis is on self-regulatory mechanisms, especially in the vertebrates, and their adaptive significance. (F, Sp, Su) [II-NL]

1121 Introductory Zoology Lab. Prerequisite: previous completion or concurrent enrollment in 1114. Laboratory study of structure and development of organ systems. Experiments on physiological process of selected vertebrates and invertebrates. (F, Sp, Su) [II-LAB]

COURSES IN CHEMISTRY AND BIOCHEMISTRY (CHEM)

1315 General Chemistry. Prerequisite: Mathematics 1503 or 1643, or math ACT equal to or greater than 23. General Chemistry is an overview of the chemical basis of natural phenomena. First of a two-semester sequence in general chemistry. Topics covered: basic measurement, atomic theory, electron configuration, periodicity, chemical reactivity and energetics, stoichiometry, gas laws and changes in state, bonding and molecular structure. A student may not receive credit for this course and CHEM 1335. **Laboratory.** (F, Sp, Su) [II-LAB]

1415 General Chemistry (Continued). Prerequisite: CHEM 1315 with a minimum grade of C or CHEM 1335 with a minimum grade of C or a satisfactory score on the chemistry placement examination. Topics covered include thermochemistry, equilibrium, thermodynamics, acid and base properties, kinetics and electrochemistry. A student may not receive credit for this course and CHEM 1435. **Laboratory.** (F, Sp, Su) [II-LAB]

3053 Organic Chemistry I: Biological Emphasis. Prerequisite: CHEM 1415 or CHEM 1425. Intended for life science majors. First course in a two-semester sequence (3053 and 3153). This course will cover the concepts of organic structure, nomenclature, and reactivity with an emphasis on biological applications. (F, Sp, Su)

3152 Organic Chemistry Laboratory: Biological Emphasis. Prerequisite: CHEM 3053 or concurrent enrollment. Intended for life science majors. Laboratory course designed to accompany CHEM 3053 and CHEM 3153. Selected experiments designed to illustrate the fundamental techniques used in organic chemistry, to develop familiarity with the properties of organic compounds and to introduce analytical techniques including spectroscopy. (F, Sp, Su)

3153 Organic Chemistry II: Biological Emphasis. Prerequisite: CHEM 3053 with a grade of C or better. Intended for life science majors. Second course in a two-semester sequence (3053 and 3153). This course will cover the concepts of organic chemical reactivity with an emphasis on carbohydrates, lipids, and proteins. (F, Sp, Su)

COURSES IN COMMUNICATION (COMM)

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

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 groups during the lab hour. (F)

2002 Professional Development. Prerequisite: ENGR 1410 or ENGR 1411, or ENGR 3511 or ENGR 3410 or concurrent enrollment; ENGL 1213 or EXPO 1213, and sophomore standing. Develop an understanding of engineering ethics, teamwork, leadership, and professional responsibility through the concepts of contemporary, social, and global issues. (F, Sp)

2431 Electrical Circuits. Prerequisite: MATH 2423 or 2924; and PHYS 2524 or concurrent enrollment. Introduction to basic principles of electrical circuits. Topics include DC circuits analysis, DC transients, static electrical fields, static magnetic fields, capacitors, inductors, and filters. (F, Sp)

2531 Electrical Circuits II. Prerequisite: ENGR 2431. Introduction to intermediate principles of electrical circuits. Topics include amplifiers, filters, signal conditioning, A/D and D/A conversion, and common digital and analog circuits. (Sp)

3431 Electromechanical Systems. Prerequisite: ENGR 2431. Introduction to basic principles of electromechanical systems. Topics include physical principles of sensing and actuation, types of sensors and actuators, and interfacing and communication protocols. (F, Sp)

COURSES IN ENGLISH (ENGL)

3153 Technical Writing. Prerequisite: 1213 and Engineering or hard science majors only. For students of the pure and applied sciences. Focuses on the forms of report writing most frequently encountered in research and industry. (F, Sp, Su)

COURSES IN MATHEMATICS (MATH)

1914 Differential and Integral Calculus I. Prerequisite: satisfactory score on the math assessment. Duplicates three hours of MATH 1823 and one hour of MATH 2423. Limits and continuity, differentiation, applications of differentiation to optimization and curve sketching, integration, the fundamental theorem of calculus, the substitution rule, applications of integration to computation of areas and volumes. (F, Sp, Su) [I-M]

2924 Differential and Integral Calculus II. Prerequisite: 1914 with a grade of C or better. Duplicates two hours of 2423 and two hours of 2433. The natural logarithmic and exponential functions, indeterminate forms, techniques of integration, improper integrals, parametric curves and polar coordinates, infinite sequences and series, vectors in two and three dimensions. (F, Sp, Su)

2934 Differential and Integral Calculus III. Prerequisite: 2924 with grade of C or better. Duplicates one hour of 2433 and three hours of 2443. Vectors and vector functions, functions of several variables, partial differentiation and gradients, multiple integration, line and surface integrals, Green-Stokes-Gauss theorems. (F,Sp,Su)

†G3113 Introduction to Ordinary Differential Equations. Prerequisite: MATH 2423 or MATH 2924. Duplicates two hours of 3413. First order ordinary differential equations, linear differential equations with constant coefficients, two-by-two linear systems, Laplace transformations, phase planes and stability. (F, Sp, Su)

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 1205. 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: PHYS 2514 and MATH 2423 or MATH 2924 with grade of C or better. Not open to students with credit in PHYS 1215. Temperature, heat, thermodynamics, electricity, magnetism, optics. (F, Sp, Su)

†G3223 Modern Physics for Engineers. Prerequisite: Mathematics 3113 or equivalent. Relativity, atomic structure, nuclear theory, wave mechanics, statistical physics, solid state physics. (F)